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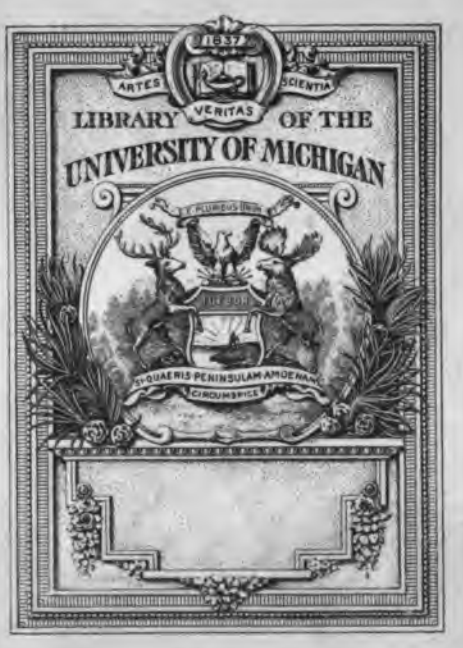
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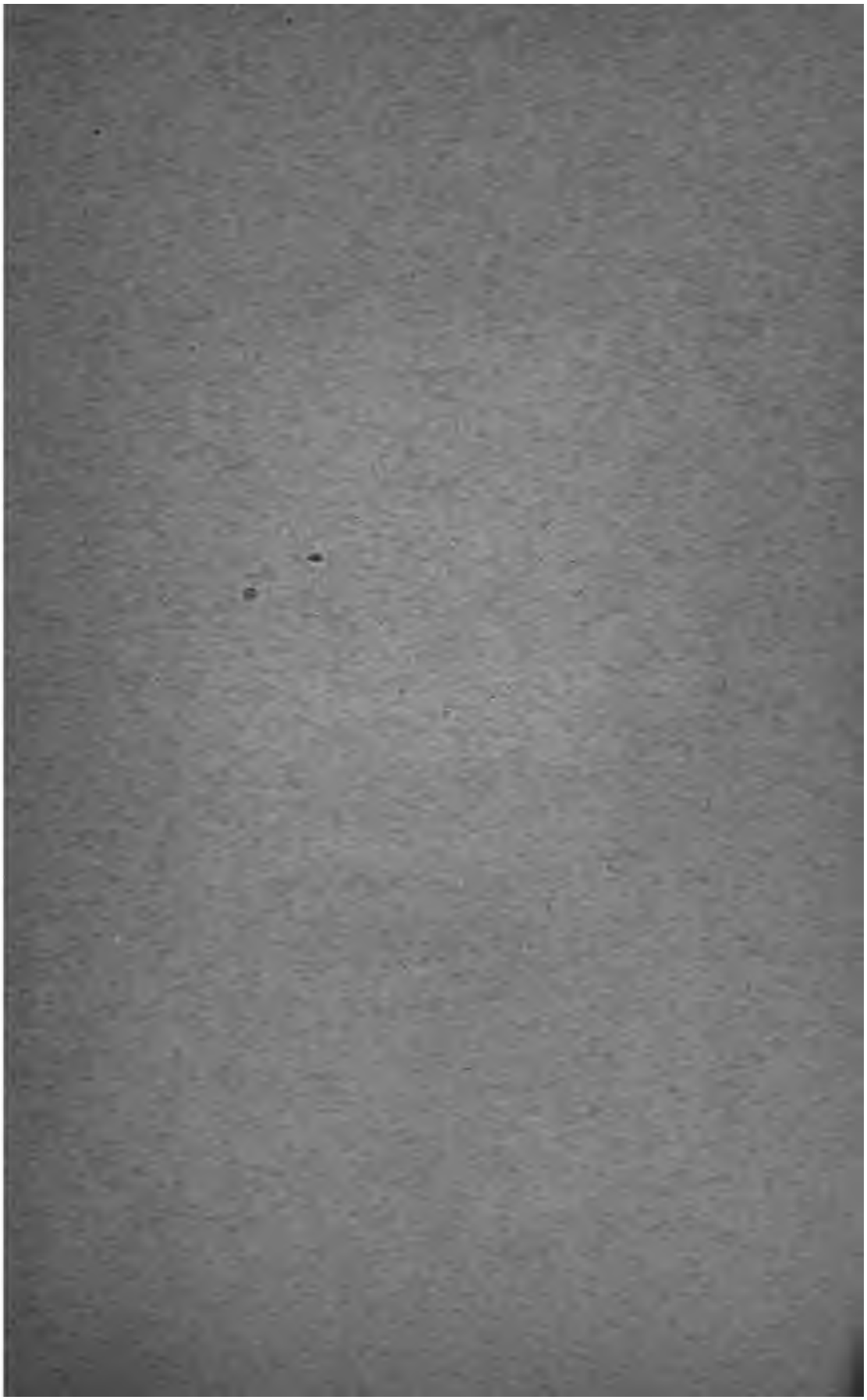

THE TECHNOLOGY REVIEW

99563

VOLUME II.

1900

BOSTON
PUBLISHED BY THE ASSOCIATION OF CLASS SECRETARIES
OF THE
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

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BY THE
ASSOCIATION OF CLASS SECRETARIES

GEORGE H. ELLIS, PRINTER, 272 CONGRESS ST., BOSTON.

Vol. II January, 1900 No. 1

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PVBLISHED AT
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AETNA DYNAMITE
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ELECTRICAL FUZES
ELECTRICAL BLASTING MACHINES
CONNECTING & LEADING WIRE
APPLIANCES FOR ELECTRICAL BLASTING OF THE HIGHEST POSSIBLE GRADE

THE AETNA POWDER COMPANY
CHICAGO U.S.A.

The Technology Review

Volume II. January, 1900 Number 1

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THE TECHNOLOGY REVIEW is published four times a year: on the first day of January, April, July, and October. The annual subscription is one dollar; single copies, thirty-five cents each. Communications should be addressed to THE TECHNOLOGY REVIEW, 71 Newbury Street, Boston, Mass.

The Technology Review

Vol. II. JANUARY, 1900 No. 1

ROBERT C. BILLINGS

It should be a subject for gratulation to friends of the Institute to note how hearty is the support given it by business men, who, though they could not have in their youth those advantages of education which it affords, have grown to appreciate its usefulness in the city, State, and nation, and have come to realize the considerable degree of success it has attained in solving the difficult problem of giving a student, within the short space of four years, a thorough familiarity with the underlying principles of his profession, and sufficient knowledge of its technique to enable him to enter at once on the practice of it, while fulfilling the requirements of a broad and liberal education.

Of the late benefactors of the Institute, none better illustrates the broad-gauged view which successful business men take of the value of scientific education and research than Robert Charles Billings, whose large bequest to the Corporation was announced a few months ago. Mr. Billings was a Bostonian of Bostonians, made of the sturdy New England stock, and imbued with that resolute spirit which carved the new nation out of the wilderness, and placed Massachusetts on the firing line of progress. To him life was a battle to be fought — and won. There must be no compromise with wrong, no concession to weakness. He

believed that every man had within him the germ of success, and that it was for him to develop it, and nourish it, until it made him the master of his work and the peer of any of his competitors. To him nothing that contributed to this end was trivial or insignificant: no detail was to be neglected, no task left undone. He knew that true greatness was builded on firm foundations, and that every plank in the structure must be sound and every nail driven home. He demanded of himself the utmost accuracy and punctuality. He left his house for his place of business at exactly the same time every day, and he arrived there on the tick of the clock. He went to his lunch at five minutes of noon, and re-entered his office at precisely one o'clock. So punctual was he, indeed, that his neighbors often remarked that they set their watches by him, when they saw him coming up the street. In his life he was the most temperate of men, doing everything in moderation, nothing in excess. He believed that most disease was due to over-eating and over-drinking; but he abstained from nothing that was harmless and innocent, and had none of the Puritan's distaste for the good things of life. He had the best of everything, but he regulated his diet by the strictest hygienic rules. In the matter of exercise he was also particular; and, although he kept excellent horses in his stable, he took frequent long walks, always walking to and from the Park Square Station to his store on Franklin Street. In fact, even up to the last year of his life, he could often be seen running across the Common, like a boy. This careful observance of the rules of health made him at seventy-five as vigorous and active as many men at forty-five. He climbed the steep hill upon which his beautiful house was built without the slightest weariness or fatigue; and, until his last illness, he never knew a sick day.

It may be thought that one so precise in business and so methodical in his living would fall into the ruts of tradition and prejudice; but it was not so. He took a keen pleasure in his business success and in his long-continued and vigorous health; yet he never conceitedly attributed these to any unusual natural ability, but believed them to be the results of will-power and discipline, which others might exercise if they would, and thereby attain a corresponding success. He admired industry and ability in others, and especially liked those who " made something of themselves," who used their talents, no matter in what direction they might lie. He worshipped honorable success in all lines.

Mr. Billings was pre-eminently a self-made man. From humble beginnings he rose to be one of Boston's foremost merchants. From poverty he attained wealth. From an insignificant office-boy, sweeping floors and running errands, he became the millionaire owner of one of the finest estates in Jamaica Plain. And, best of all, he won it honestly. In his long business career there is no instance of unfairness to competitors or employees, no blemish or stain on his name. His integrity was adamant: it might be assailed, but it could not be shaken. He was a man with a strong moral nature and an iron will.

A fine feature of Mr. Billings's character was his devotion to his mother and his veneration for her memory. He often spoke of her as the inspiration of his life, and told of her sacrifices and fortitude under most trying circumstances. His father, who was a ship-chandler, failed in business; and his mother refused to take the property which was legally hers, saying that the creditors should receive every cent available. The son gloried in her action; and declared, that in times of temptation in his business life, it had often been a source of help to him.

His parents were devout members of the old Brattle Street Unitarian Church, and he was always an active member of and liberal contributor to that denomination. While a resident of Boston, he attended the South Congregational Church, of which Rev. Edward Everett Hale is the pastor; and on his removal to Jamaica Plain he joined the Unitarian church there, and bore the expense of erecting a stone tower upon its meeting-house. He was a constant attendant, and was always seen in his pew, whatever the weather, up to the time his late illness confined him to the house.

He was born on Fort Hill in Boston, January 3, 1819, and lived in the city all his life, dying June 12, 1899, in his eighty-first year. He was the son of Ebenezer and Elizabeth (Cleverly) Billings, both of whom came from old colonial stock, his father being of the Billings family of West Roxbury, and his mother of the old Nash family of Weymouth. He attended the public schools of Boston, and won one of the Franklin medals for scholarship, but entered upon his business career at the early age of fourteen, when he obtained a place in the dry-goods jobbing house of Thomas Tarbell & Co. in State street. He remained with this firm and its successor all his life, a period of sixty-six years, and died its senior member and chief owner,—a record rare, indeed, in these days of constant changes. His industry and ability attracted the early attention of Charles Faulkner, a member of the firm, who took him into his confidence and promoted him to a position of responsibility, which he filled with such fidelity as to lead to a lifelong friendship between the two men. Mr. Billings was soon taken into the firm, and remained with it through all its various changes in name and *personnel.* At the time of his death he was one of the oldest

men engaged in active business in Boston. He was twice married, but left no children.

Mr. Billings left what has been well called "a noble will." He bestowed all his vast wealth with remarkable discernment and discretion; and the leading institutions of learning, as well as many of the most worthy charitable societies, have cause to bless his memory. He bequeathed the Institute of Technology, without restriction, the sum of one hundred thousand dollars, with an additional fifty thousand to found the "Billings Student Fund," with the understanding that any student receiving benefit from the fund is expected to abstain from the use of alcohol or tobacco in any of their varied forms. It will be noted that he does not require the signing of a pledge or previous abstinence, but leaves it to the honor of the student to carry out his wishes. Bequests of one hundred thousand dollars each were also made to Harvard University and to the Boston Museum of Fine Arts; while twenty-eight other institutions, including numerous hospitals, colleges, and some religious establishments, were donated amounts varying from ten to fifty thousand dollars.

ARTHUR A. NOYES, '86.

A Corner of the Cloister,
Saint Trophime, Arles.

A DAY IN PROVENCE

During the first weeks of the tour of the Summer School of Architecture, we had been looking forward to the architectural treasures of the Rhône valley, and, while pushing our bicycles over the long mountain grades of the Riviera, had often comforted ourselves with thoughts of the level country ahead. The eastern edge of the great plains of the Camargues, however, is quite broken by rocky hills and ravines; so, as we journeyed from Marseilles in the afternoon train, stopping at all the little stations of a branch road, our approach to Aix was varied by numerous tunnels leading to the long curved viaduct over the river Arc.

On either side, the deep green valleys, the water-worn rocky hills, and even the gray house-tops of occasional villages seemed to tell of the ancient character of the land. Far older in appearance than the fertile plain of northern Italy or the mountains of the Riviera, the environs of Aix harmonize with the tradition of this most ancient Roman settlement of Gaul, the resting-place of the legions of Marius and Cæsar. But the baths, palaces, and temples of Aquæ Sextiæ, visited by consuls and patricians as early as the second century before Christ, were destroyed by the Saracens in the eighth century, and the modern city gives little evidence of its former splendor. Aix-en-Provence is, however, a most interesting town. Its broad boulevards shaded by dense screens of foliage, its numerous fountains, statues, and large modern buildings indicate that the former capital of Provence is to-day deeply interested in progressive municipal government.

Taking our bicycles from the train, and seeing that no

Hôtel de Ville and Beltry, Aix.

repairs were needed, we soon wheeled into the shadows under the leafy covering of the magnificent Cours Mirabeau, and at last, among the larger houses of the northern side, found the Hôtel Nègre Coste.

In the early morning, after paying for a table d'hôte dinner, a bed, and a good breakfast the moderate sum of six and one-half francs each, we oiled bearings and made all ready for the fifty-mile ride before us. Deciding that we had not time to visit the paintings and antiquities of the Museum, or the modern buildings of the École Nationale des Arts-et-Métiers, we bumped along the rough stones of the older streets, passing the colonnade of the Palais de Justice and the memorial obelisk fountain in the Place des Prêcheurs. At the upper end of the Place we stopped to examine the Dominican church of Sainte Marie Madelaine, attracted by M. Révoil's bold Renaissance design for the façade. Thence by devious ways we went on past the prisons and corn market to the Hôtel de Ville and belfry. Only the narrow end of the Hôtel de Ville faces the public square, and this side gives little idea of the real extent of the building. Its modern additions somewhat disturb the original design; but its three stories certainly show Renaissance details that in general character are far more Italian than French. Close to the corner rises the belfry, erected one hundred and fifty years earlier than its seventeenth-century neighbor,—a plain mass of stonework that is varied only by the archway and heavy cornice, although the plain walls are a little softened by the Gothic decorations and the Renaissance sculpture around the old clock face, and relieved by the curious wrought-iron railings and bell spire. During our tour in the Rhône valley we noticed many bell spires resembling this open structure at Aix; but some were far richer in detail, with wrought-iron work showing great variety in design.

Coming at last to the square in front of the Cathedral, we placed our wheels against the walls of the Académie, and began our search for architectural traditions. No better

Aix Cathedral — Eleventh-century Door.

example of changes in the development of French mediæval architecture could be chosen than that offered by the two entrance doors of the Cathedral of Saint-Sauveur. The southern door opening into the nave of the eleventh-century church has the Romanesque corner columns, raised circular arch, and carved horizontal mouldings of the earli-

est Provençal type,— a development from local Roman monuments and Eastern churches. On the other hand are found in the decorations of the central portal all the ele-

Aix Cathedral — Fifteenth-century Door.

ments of northern Gothic work. Its deeply recessed and moulded archway, flanked by strong yet richly decorated buttresses, its canopies, statues, and double doors of curiously carved woodwork, show the elaborate treatment of the latter part of the fifteenth century.

The interior of the church, moreover, has a similar vari-

ation in style. Of the three naves the southern is by far the most interesting to the architectural student, because of its simple treatment of pointed stone vaults and arches. Near the middle of the old nave the usual Provençal vault design is varied by the introduction of a ribbed octagonal dome that rests, with the help of conical trumpets, upon four large circular arches,—a unique arrangement, entirely in keeping with the rest of the roof, yet serving to enlarge and emphasize the central part of the nave after the fashion of the domical Byzantine churches of the East. Opening off this nave is the octagonal room or baptistery, still retaining its sixth-century form and possessing eight antique marble and granite columns that originally came from a pagan temple of Apollo, erected on the same site.

But the gem of the whole is the little Romanesque cloister placed on the south side of the church and surrounded by the walls of the Archbishop's Palace. This is one of the most interesting examples of monastic architecture in this part of France, since within its small area a great variety of carved capitals, piers, twisted and coupled columns, and arch decorations is still in fairly perfect condition. Last summer the arches of one side required the assistance of wooden supports, but it is to be hoped that all necessity for temporary braces will soon be removed and the whole arcade properly restored.

Returning from the Cathedral to the new part of the town by way of the Boulevard Notre-Dame, we skirted the walls and gardens of the city "thermal establishment," which dates from the baths constructed in 124 B.C. by the Roman consul Sextius Calvinus. However, as little of the original structure now remains, and water at 97 degrees temperature did not seem inviting on a warm July morning, we continued our way to the Place de la Rotonde, to

see by daylight the fine fountain we had passed the night before when entering the city. Placed at the centre of a large open circle formed at the junction of three boulevards and two streets, the Fontaine de la Rotonde has within its

Fontaine de la Rotonde, Aix.

huge ninety-foot basin a generous play of water, that in this region of brilliant sunshine is particularly refreshing to eye and ear. Crouching lions, boys and swans, dolphins and conventional ornament help to vary the regular lines of the three huge basins. The top is finished by three standing figures, Justice, Arts, and Agriculture. These face the three principal avenues, but seem small in scale for such a conspicuous position.

Taking the boulevard to the right of the fountain, we were soon riding over the national route to Nîmes, having first a stiff climb out of the valley of the Arc. At the

top of the hill we found ourselves at the beginning of one of the long straight runs common to the great first-class roads of France. For seven long miles we rode up and

National Road — Aix to Lambesc.

down hill, over a dazzling white surface and without shelter from the intensely hot sun. Fortunately, the two-mile coast down to the railroad crossing diminished the labor; but, after we reached the rising grade, there was little respite until we came to the bend in the road at La Pile.

Dismounting in the shade of the trees around the Fontaine d'Armeux, we drank as freely as we dared from the carved water-spout, thrust arms and heads into the dark waters of the great stone washing-basin, and then tried to cool off by lying on the grass and watching farm life about the solitary house on the other side of the road. And what a welcome relief to our burned eyes the green shadows and

cool water afforded after the blinding sunlight of the roadway! No more fatiguing work can be found than the monotonous pedalling along such a great national road. We therefore were in a position to appreciate the task of the helmeted postman who stopped to deliver a letter at the farm-house, and then courageously pegged away in the

Lambesc from the hill-top.

heat and sunlight. After our short rest we passed into the sunlight again, and the distance to St. Cannat was quickly covered. But we stopped in the village streets only a short time, to look at the ancient tower of the church, and to examine several interesting though half-destroyed fragments of Renaissance houses, possibly the remains of a château of the Bishops of Marseilles. The doorways and window mouldings of these buildings seemed unusually weather-worn and battered, probably on account of the exclusive use of soft stone for the façades. Taking the right fork of the road at the centre of the

village, we rode some three miles farther on, continually ascending over barren, rolling hill-tops until we reached the summit and looked down into a narrow valley where the grey roofs of Lambesc were surrounded by a green wall of trees.

Though the Guide Joanne states that Greeks from Marseilles established a prosperous market here, that Lambesc was a thriving town in the sixth century and had its own lords in the Middle Ages, at present the nearest railway is eight miles away; and all traffic and communication are carried on by the great roads alone. We expected to find interesting buildings in this town, and we were not disappointed. It proved to be a rambling place, built on the slope of the hillside and divided, after the fashion of most of these old southern cities, into old and new quarters. In the upper part of the lower section rises the ancient clock tower, bearing an iron belfry even more elaborate than that seen at Aix. Many very old houses line the narrow side streets, the Renaissance houses apparently predominating in the section we visited. But we were searching for the dome of the church that we had seen from the hills, and did not stop to examine the tower details.

The church is placed on the north side of an irregular square surrounded by high houses, and has a broad, uninteresting Renaissance façade, decorated with engaged columns and horizontal entablatures. The interior is overloaded with pilasters, but as a whole is dignified and sombre in aspect because of the dark color of the stone and the method of top-lighting through the windows of the central dome. The details of both exterior and interior suggest Italian influence throughout. The fact that the town was almost completely destroyed in the wars of the thirteenth century may account for the absence of older details in the body

of the building. The most attractive part, however, is the Gothic spire that rises on the west side of the nave from the fortress-like walls of what seem to be the remains of a Romanesque church. Because of its bold shadows

Church Spire, Lambesc.

and graceful window decorations, this fragment is crisp and vigorous, especially when compared with the cold details of the rest of the building.

A little later, while seated at a café table, drinking a bottle of "limonade," we were much amused by the arrival of the steam omnibus from Cavaillon,—a huge vehicle that with infinite labor puffed and rattled up the stiff grade of the main street. When we passed the noisy apparatus on

our quiet bicycles, although it had stopped to discharge passengers, it still kept up an infernal racket, to which every one on board seemed entirely oblivious. From several incidents of this sort, we at last came to the conclusion that French countrymen have an innate love for machinery, the utility and convenience of the apparatus having little to do with the question.

At Lambesc we left the national highway behind us, and started on a delightful run down a narrow, winding road, with good macadam surface, following the green valley of a little branch of the Touloubre,— a grateful contrast to the white road-bed and dry hills we had just passed over. The continuous down grade, combined with our fears of a late arrival for déjeuner, encouraged such a lively pace that we rushed into Pelisanne before we could believe the necessary distance had been covered. Here a belfry with iron top and a curious group of church buildings detained us only a short time, for the pangs of hunger prevented a just appreciation of what seemed to be quite ordinary mediæval work. Pushing on around the church, which stands directly in the way of the present main road, we hurried on to Salon, where, after inquiring the way of a local bicyclist, we arrived at the Grand Hôtel, late, but welcome to all the house afforded. Iced siphon, good local wine, and a generous dinner soon repaid us for our forced pedalling, but, sad to say, took away all ambition for the long afternoon trip originally planned. Tired muscles, once relaxed, recover slowly; and our hot morning ride seemed discipline enough for that time. Yet our original plan was to reach Arles before night, that we might be ready for the entertainment promised for the Fourteenth, the French Fourth of July.

An afternoon train was naturally the first suggestion. The map showed a railroad through Eyguieres, Paradou,

and Fontvielle, towns that we had hoped to visit, on the northern edge of the great plain; but consultation with our landlord brought out the sad fact that the afternoon train over this *chemin de fer régional* left Salon at about six, and arrived at Arles about nine in the evening, taking three hours to drag its coaches and stone-laden cars over the twenty-eight intervening miles. The only alternative at first seemed to be the straight national road; but, as we had had enough of national routes for that day, it was decided to see Salon in an hour's walk and ride, and then meet the through express at Miramas, some six miles away to the south. Starting at once to see the twelfth-century doorway at Saint Michel, we found the Romanesque portal less interesting than the older door at Aix, and then pounded away over the rough stone pavements to visit the northern section and the collegiate church of Saint Laurent. With the exception of the lower stories of the old tower, Saint Laurent dates from the time of Jean de Cordonne, Archbishop of Arles, who in 1344 built the plain church that to-day is the only survivor of several monastic buildings. The place is now famous as the tomb of Michel Nostradamus, the Provençal astrologer, who resided at Salon for years, and gained a reputation for prophecy and learning that made him adviser to Catherine de' Medicis and doctor to Charles IX.

Since this church offered little of special architectural interest, except the fragment of the older building now under the picturesque south tower, we returned to the central part of the town, and, passing the fine old gateway, and clock tower, started along the road to Arles. Fortunately, our route to Miramas turned off to the south, after a few rods of very indifferent riding. The Salon and Arles sections of the Carte de la France show the distance between the cities to be about twenty-four miles, with eleven miles in an

Cloister of Aix Cathedral.

absolutely straight east and west line, that follows the north bank of the Langlade canal across the level plains of the Crau. At the hotel we were assured that the distance could be easily covered in a little over an hour,— a statement we did not attempt to verify; for we were quite content to leave the proof to men with less heavily loaded wheels. With plenty of time ahead, we jogged along a wide level road, passing several omnibuses filled with country people returning from Salon markets. On either side the luxuriant trees and low growths of the marshes were occasionally broken by quiet pools whose shallow depths, joined by numerous canals and ditches, seemed to form a veritable network of waterways.

We expected to visit the ruined château at Miramas, some three kilometers beyond the station, and a little further on to see the triumphal arch of the Flavian bridge at Saint-Chamas; but, as a troublesome pedal caused delays and repairs along the way, we arrived at the modern village of Miramas-Gare only in time to buy tickets to Arles, to pay our ten centimes for bicycles, put our wheels on board, and hurriedly find places in the crowded train. Many times during that ride we congratulated ourselves on the change in plan, even though we had omitted the towns on the southern slope of the Alpilles. Taking saddle again at the Arles station, we passed through the open avenues of the Jardin de la Cavalerie to the towers of the city gates, when we were at once in the narrow, tortuous streets of the mediæval city.

Arles is not known for its late buildings, though, by walking its roughly paved ways, many good sixteenth-century houses are to be found. To the student, and even the casual visitor, the Roman and Romanesque monuments are of far greater interest, for Arles has to-day some of the best

examples of ancient building and sculpture to be found in Europe. Fortunately, several hours of daylight remained after our quarters were secured in the Place du Forum; and we hurried to catch a first glimpse of the famous build-

Place du Forum, Arles.

ings we were to study in detail later on. Leaving bags unpacked and wheels uncleaned, we tramped from the hotel, past the unknown fragment of Roman architecture at the head of the Place du Forum. However, as we were to pass that way many times, we did not stop to examine closely its

broken pediment and columns, but continued through the Rue des Arènes to the great amphitheatre.

To-day, as in the days of Augustus and Constantine, this huge Roman ruin is the centre of Arlesian life and interest.

Corridor of the Arena, Arles.

Thanks to the restorations made since 1846, the double-storied outer arches and lower interior seats are now in good condition. Yet the building no longer affords room for the twenty-six thousand people who applauded the conquerors in the old gladiatorial days. The Arena is now used for

less sanguinary entertainments; and the *courses de taureaux*, held almost every Sunday during the summer season, are attended with unabated interest. Large crowds, even, come to see the bloodless, free-for-all sports occasionally offered, when prizes are given to the citizens who succeed in tearing away the barbed rosettes from the shoulders of wild young heifers and bulls.

Not attempting to enter the great enclosure, which we expected to examine thoroughly after the bull-fight of the morrow, we walked along the side of the huge elliptical wall, studied the peculiar construction of its stone arches, and tried to imagine the appearance of the whole, when arches, columns, and mouldings were in their originally complete state. The building was partly destroyed by use as fortress and stronghold by Goths, Saracens, and mediæval warriors. Previous to 1830, also, the interior was filled with houses of the poorest class. Yet the endless arcades, even in ruined form, seem to tell of far greater enterprises and ambitions than those of wild invaders or local chiefs, and by simple dignity alone recall the might and power of imperial Rome.

From the south side of the Arena to the picturesque ruins of the Theatre is only a short distance. We were soon looking into the meagre ruins from the raised ground at the rear of the stage. Evidently, the Theatre was the artistic centre of ancient Arles; for the two columns of African or Carrara marble still standing in place, the carved fragments of the stage walls, as well as the numerous sculptures and decorations now in the Museum, all show details and motives of the best imperial epoch. Here also was found one of the treasures of the Louvre, the famous Venus of Arles. As a whole, the Theatre is now so ruined that it seems hardly possible that some sixteen hundred

people could once be accommodated within its walls; but even in its dismantled state the fragments on the spot and the sculptures of the museums show without possibility of denial that this building was one of the most artistic creations of the Roman emperors. Though surrounded by house-walls that are far from picturesque, it still pos-

Ruins of the Theatre, Arles.

sesses an air of Greek elegance and refinement seldom seen in Roman work.

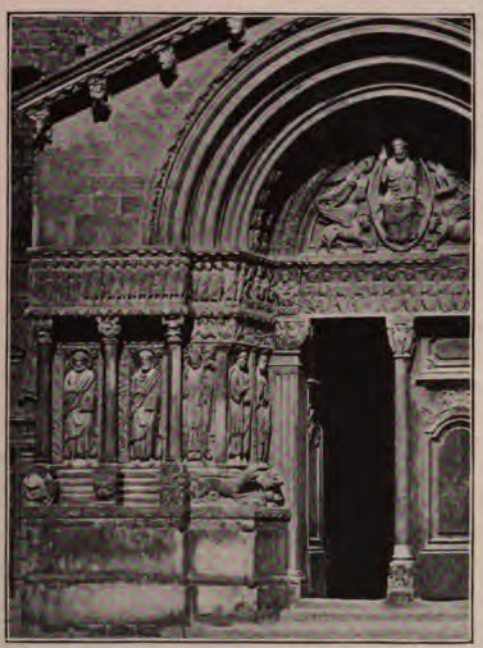
From the Theatre we passed through the little crooked Rue du Cloître, showing in its upper part the Gothic entrance to the cloisters of the Cathedral, and then, after passing the walls of the old Bishop's Palace, found ourselves in the Place de la République and before the chef-d'œuvre of French Romanesque sculpture, the porch of Saint Trophime. Provençal tradition has it that Saint Trophime was sent to Arles by Saint Peter himself, and that he built the first church on the site of the Roman prætorium. However that may be, it is known that a portion of the present church was consecrated in the year 606, and that

the portal and part of the cloister were erected in the twelfth century, possibly by the famous crusader Raymond IV., Count of Toulouse and St. Gilles. The porch seems to have been erected shortly after 1152, when the sacred bones of Saint Trophime were removed from the great burial-ground of the Aliscamps and placed in the Cathedral.

Place de la République, Arles.

The portal is simple in general form, but was intended to express far more than an ordinary stone entrance. Its deep recess, its wide frieze, and sculptured panels, present a picture of the last judgment with a vigor and realism that only firm belief and loving regard could produce. The central figure of Christ seated in judgment, surrounded by the symbols of the four apostles and a double arch of angels, fills the upper part. Immediately below is a broad frieze of figures, portraying the twelve apostles with a group of saints on one side and the punishment of con-

demned sinners on the other. The entire frieze is so designed that rhythmic action and architectural effect are preserved in a remarkable degree. Below are short columns, resting on the backs of grotesque animals; while in the square niches formed between these columns stand



Porch — Saint Trophime, Arles.

large statues of saints, separated and enriched by bands of conventional ornament. The figure of Saint Trophime in bishop's costume is perhaps the most interesting of these large sculptures. The great importance of this decorative composition was evidently appreciated when first designed; for it is raised on a simple basement approached by a broad flight of steps,— an arrangement which gives great dignity to the whole composition.

In the dim recesses of the nave the plain stone vault and walls could hardly be distinguished in the late afternoon light, but we could see that the monastic simplicity of its

Pier in Cloister — Saint Trophime, Arles.

barren spaces was quite in accord with the nave of the old church at Aix which we had visited earlier in the day. Passing through the dark aisles, we climbed a long flight of wide steps, and came at once into the quiet enclosure of the cloisters, famous for their symbolical carvings and picturesque architecture. Here the constructive and decorative arts are happily combined. But the fading light prevented

more than a walk around the vaulted passages and a rapid glance at the bold carvings of the corner piers. So, arranging with the old concièrge that we should return the next day to listen to his quaint stories of the saints and heroes under his charge, we stumbled out through the dark church, and, after turning a corner or two, took refuge for the night in our hotel.

And refuge it really was; for the night before the Fourth, or rather the Fourteenth, had already begun, and only adventurous spirits dared to brave the dynamite crackers and serpents that exploded in unexpected places or chased the daring pedestrian with a fiendishness and velocity that defied resistance or escape. The practical joker was abroad; and nothing suited better than the filling of an open shop with countless sparks and deafening explosions or the scattering of quiet café groups by means of the erratic serpent. Every man was an enemy for the time being. Shutters were closed, doors barricaded, and only blank walls exposed to the wandering fireworks that shot around the Place du Forum. At last, after venturing out a short way, the risk of burnt clothes and singed hair drove even Americans within doors; and we retired for the night with visions of the entertainment promised for the morrow — the military parade, the entry of the bulls, the bull-fight, the evening concert, dance on the boulevarde, and costumes of *les Arlésiennes* — sadly confused with the towns and buildings we had seen during the day.

Three days spent in sketching and tramping around Arles failed to exhaust its architectural treasures; and the hours spent in drawing the details of the cloister and the fine fragments in the Museum went quickly by. But, although we visited many interesting sections in our journey up the Rhône valley, across the Cevennes, and down the Loire and Seine to Paris, our first day among the old

Provençal towns was unique, because the unexpected and the unforeseen combined most happily to give us one of the busiest and most instructive days of our summer tour.

ELEAZER B. HOMER, '85.

JANUARY 1, 1900.

PRESIDENT CRAFTS TO THE ALUMNI

ANNUAL DINNER, DECEMBER 29, 1899 *

Mr. President and Gentlemen of the Alumni,— Large accessions to our funds are a less prominent feature this year, and yet the Treasurer announces a net increase in the property of the Institute of $437,000. It is true that it was known at our last meeting that the greater part of this sum was coming to us, but I may now speak of a further sum of about $170,000 which will come to us in the course of this year and which does not appear in the Report.

It is grievous to be obliged to state that $60,000 was paid to the United States as a succession tax. The constitutionality of the tax has been contested before the Supreme Court, and a decision will soon be given: if it is affirmative, an attempt in favor of institutions like our own and of charities will be made to move the legislature to abolish or diminish the tax. The plea is made that it is not necessary for the support of war expenses, and that it discourages gifts to educational, charitable, and religious organizations.

My Report states that this year has been notable in the

* An account of the annual meeting and dinner of the Alumni Association, held on December 29, will be given in the April number of the REVIEW. In anticipation of this, we are happy to be able to publish in the REVIEW the admirable address of the President.

educational annals of New England, because of the inauguration of presidents at Amherst, Wellesley, Brown, and Yale. President Hadley in his inaugural address had much to say of the difference in character and spirit between the college and the professional school, taking the military academies of West Point and Annapolis as a type of the professional school. The words used in his description of a homogeneous body of men united by a professional standard apply equally to our own students during their school years; and I think that you, the alumni, will bear me out by your opinions, and still better by your practice, when I go farther and speak of you as united for life by a high standard of professional honor and as marching like a disciplined army to take part in the conquests of civilization.

It is profitable for us who are all of one household, and who have met together to-night to talk freely of the old school-days and to form projects for the future of our Institute, to take up the theme which has been suggested by others, to examine in what way our education differs from that of the college and to see whether new features of collegiate education can be applied to the Institute.

First, you have differed from collegiate students in having made your choice of an occupation at the age of eighteen, instead of leaving it still in doubt, as do so many college graduates, at the age of twenty-two. You have remained steadfast to your early purpose, since nine-tenths of you are still engaged in some scientific pursuit. Most of you are ready to attribute your success in life to the kind of training which you received at the Institute. All this speaks well for our education; but it was not perfect, and now, as you look back upon the four best years of your youth, what would you have changed for the present generation?

This after-dinner time, when we meet once a year, is a moment when such questions can be put freely; and often, in your visits to your Alma Mater, you are willing to give us answers, and we always value your advice founded on experience.

You will see that what I have to say is chiefly in approval of the present system; but suggestions have been made for changes in two directions, and it is necessary to give some reasons for our preferences. The suggestions are with reference to greater laxity in the courses of study, and of some movement to stimulate competitive athletics and in general class feeling and the joys of college life.

Within the last thirty-four years, since the foundation of the Institute of Technology, and even before, the professional school has done much to transform collegiate education; but the most noticeable change in American colleges has been the introduction of electives and athletics, and it is certain that they have greatly contributed to make college life popular. Has the time come to diminish studies, to increase sports, and to introduce these features into the schools of applied science, where the students are of the same age as in the colleges and have similar tastes?

The wishes of father and son sometimes concur to demand the change; for many a man of the older generation, and often one of the most successful and best workers of his time, looks back with most satisfaction upon the idle episodes of his college life, and deliberately chooses that his son should pass four happy years, thoughtless of care and careless of thought. He enters the willing youth at some college, where a compromise can be made between his programme and the more serious outlines of the academic prospectus, and where large toleration is exercised in favor of youthful athletes.

The picture would be completely false, were it not added that the opportunities offered to athletic and social tastes are only incidental upon a generous freedom of choice in the amount and kind of studies, and that the chief aim of all our colleges is to make education attractive by offering a varied and abundant feast from the ever-growing tree of knowledge. The number of elective studies has only become so large and so well suited to every mind through the immense effort made by our universities to offer an adequate presentation of all classical learning and of modern art and science; and, so far as possible, a presentation at first hand by original discoverers is provided.

First, as to electives, I believe we are doing what we can when, with stricter conditions regulating a minimum of studies, we allow the attendance of special students; and the range of our studies in science and in art is considerable. Our main business, however, after having asked a student to make an early and definite choice of a profession, is to guide him through a sequence of studies which shall enable us to say in his diploma that he is fitted to take up a certain occupation. With such an object in view, it is agreed upon all sides that the strict direction of professional studies must lie in the hands of the teachers, and that few opportunities can be offered to varying inclinations to make excursions from the line of march. It may be added that the task imposed upon the Faculty is no light one when a programme has to be established for new studies with appropriate sequence and prescribed hours. The difference between our system and the collegiate want of system is most felt when uncongenial studies are interspersed among those of a chosen branch, and certain subjects are taken as bitter doses. Is there, however, any profession, except perhaps the pursuit of art or of pure

science, where a man is not obliged to do what he does not want to do? And is not such compulsory work a fitting training for practical life?

The question can be answered if we examine a mode of instruction carried to its extreme, as was done at the time when the courses leading to honors at Oxford and Cambridge were largely formed to suit the convenience of the examiners, and were in part dry test subjects rather than the elements of a complete education. Yet, when Macaulay was questioned as to the careers of those who stood highest under these tests, he, without preparation, gave the names of all those who had taken highest honors at his university, Cambridge, for all the years from 1800 to 1860, and showed that they had usually distinguished themselves in the most varied careers.

It must be admitted that there is a danger attendant upon our system of careful direction; but it does not appear to be inherent in it, and it might be partly eliminated by efforts on the part of teachers and students. Let me submit this question to your retrospective judgment: Were you not a little too much preoccupied with the desire to fill your four years' course with the most authentic information in largest possible quantity, until you became haunted with a feeling of the shortness of life and the length of art? Did you not get to consider it bad economy to think out certain things for yourselves, when you could find them out by asking a professor? — not in a spirit of laziness, but of avidity for knowledge. Research work developed originality, and the whole training made for self-reliance; but, I fancy, too few of you found time for taking up those unguided speculations which are most educational in the end. Regnault said that his class in mathematics was so strong because it had such a bad professor; and, in con-

sequence, after each lecture the class met together to go over the work by themselves, Regnault being their chairman.

If ever we have a larger number of electives, and I think it will be possible to do so in some courses, they will enter through the door just pointed out to you, and it will be the students themselves who will hold it open. New fields of study can be introduced without too great effort or expense when groups of students learn the art of catching an inspiration from a master, and appropriating it to themselves by reflection and by discussion. A French authority has been quoted in regard to mathematics; and, again, it may be pointed out that the precision of the French mind comes quite as much from such habits of discussion as from methodical training. An example of a maximum of effect with the minimum of professional teaching is to be found in the French studio of painting or architecture, where the master impresses his style and his modes of thought upon his scholars, although he may criticise each one no longer than ten minutes during a weekly or fortnightly visit.

The large numbers gathered here to-night may be taken to mean that the gymnasium project is a subject which this year strongly interests the alumni. The desire to do something important and appropriate in affectionate remembrance of General Walker has led to a well-organized movement among you to be continued for five years, and to result in the collection of funds for a memorial building; and you have just listened to an admirable report from your committee.

Good progress is reported, and now that more than $20,000 has been collected, or promised, an appeal is made to the government of the school to spend immediately $75,000 or more to buy and hold land nearer to the Institute

and more expensive than the Garrison Street land, in order that the gymnasium shall be erected upon it five years hence. You are asking the Corporation to take money now devoted to supporting courses of study and to use it for this purpose. Perhaps it may interest you, the alumni, to have me state how this proposition is likely to be received by the Executive Committee of the Corporation. However, I can only speak for myself regarding the last part of the subject, for it has not yet been under discussion by our government. We have had constantly in mind the desire to add all forms of physical exercise to the strenuous mental exercise which is demanded from our students, and we are sure that one will support the other. Even the weariness of hours of standing in a designing-room or laboratory is relieved by gymnastics; and the time consumed by lectures, drawing, and experiment still does not preclude gymnasium work. For these reasons the place for athletic exercises should be made as attractive as possible, and I can assure you that the terms of the report of the Gymnasium Committee meet with hearty approval and that a great effort will be made to comply with their request. The question is an urgent one because we may at any time be deprived of the site of our present gymnasium.

Shall any one seek to combine the movement described in the gymnasium report with another destined to change the policy of the Institute regarding competitive athletics, I will say that I think that our policy can never be the same as that of a college. And, if you would know the reasons, I will give them in the words of one who was devoted to the end of his life with youthful fervor to athletic games, one who has pronounced the most eloquent eulogium upon college sports, and has found nothing but appreciative

words to say of competitive college athletics, and has found everything to say in favor of exercises and games in our own school; and yet, at the end of a Phi Beta Kappa oration, June 29, 1893, he gave the following judgment: —

"But, if we concede that these exercises and contests are to hold their place in American life, is there no stopping-place, no point at which college authorities or the young men themselves, on their own motion, in their own discretion, for their own good, can say, 'Thus far, and no farther'?

"I answer, yes: there is such a natural stopping-place. It is at the doors of the professional school. . . .

"In and after the professional school, whether that be a school of law, of medicine, of divinity, or of technology, there should be no representative teams. The principle of competition and championship should be dropped. Individuals should continue at their pleasure to play tennis or cricket or football with their classes, with private clubs, or in town and county matches; or, if teams be formed in such schools, they should not be regarded as carrying the honor of their institutions around with them. Such teams should not expect victory. They should play for exercise and for the fun of the thing, and should accept their inevitable beating with serenity and good nature."

These words were uttered by the man whose name will be graven over the door of your new gymnasium; and, if it is to be a memorial, let the spirit of these sentences be inscribed in your memories.

General Walker, as you all know, liked a fair fight, and was not wanting in a keen relish of the competitive side of life; but we may well believe that his views were enlarged by the fact that, while still of college age, he was taking his athletic exercise in the muddy roads of Virginia

and on the battlefield, that he took his manful part in the competition between rival armies with the whole world for spectators. And, since such features seem inseparable from athletic struggles, it may be added that all the stock exchanges of the world were betting on the results.

A man who had played that stern game with the honor and integrity of a nation for the prize, and death for the forfeit, may well ask you to lay aside what he calls athleticism when you enter upon the very serious task of preparing for a life's work at a professional school.

In conclusion I wish to express a wish for the future of the Institute. I hope that in years, perhaps far distant, you will witness a change in the direction of our studies and a progress toward those which are generally considered in Europe as belonging to the highest forms of university education. Much that we teach in our universities would be considered by European critics as belonging to preparatory schools. What distinguishes above all things the highest education supported by public funds in European states is the freedom of the position made for the professor. A man who has invented a new science or a new philosophy has a chair created for him. He becomes a pensioner of the state for life, with no onerous obligation to teach, and with the confident assurance that his own way of bringing his knowledge into use will be the best way. Such a man is sure to be a leader of men, although individually he may come into contact with few. The places made for the great masters have also determined in some degree the position of the university professor. Many inferior places are open to men capable of original research, and the state has found by experience that money invested in genius or even in respectable talents brings in quick returns. With few exceptions such places have not yet

been made for our best men in art or science; but, if private citizens or states will found such chairs of research, we have the men ready to fill them. They belong in a school of applied science as well as in the university.

You will see in the future a more diversified composition of the technological institutes. There will be then as now a large body of students seeking to take the shortest road from the high school to the exercise of a scientific profession. The number will increase of older students, who, for pleasure or profit, or for both, have taken a college course before taking professional training, probably many of them spending two or three years at the college and a corresponding time at the school of applied science. We may hope also that around the eminent men of science now at the Institute, and around those who may be added to their numbers in the way that I have described, there may be grouped students of all ages, and even some among them who may retire from business cares for a while, to make a special study of scientific problems. Only by the union of all these forces can our Institute arrive at its highest usefulness in art and science, and offer education fully worthy of this wonderful age.

EDITORIALS

The recent munificent gift of $50,000 to the Massachusetts Institute of Technology, by Mr. Augustus Lowell, to serve as the nucleus of an endowment fund for the benefit of its instructing staff, emphasizes a very present problem in collegiate administration. The well-defined idea prevails among the general public that college professors are underpaid as a class, consideration being taken of the character of their service and of the years of unremunerative preparation required for their work. If this be so, the matter of making some provision for them in cases of old age or disability becomes one of simple justice. Columbia University was, perhaps, the first to inaugurate a definite policy of retirement under pension for members of its faculties. It is but two years since Harvard adopted such a system. Cornell University has for some time held a similar project under advisement.

It will thus be seen that the problem presented is of more than local significance. Most of our universities and colleges, it would seem, are now adequately equipped with scholarship funds. There is little expectation that any earnest and deserving young man will fail to secure substantial aid in the attainment of a college education. President Hadley, in his notable inaugural address at Yale, wisely directed attention to this fact. Private benefaction has generously provided for this result. For example, at the Massachusetts Institute of Technology there are now funds yielding an annual income of $24,000 for the specific aid of worthy students. The problem of the future is not to make provision for the needs of the students, but for the instructors.

It is curious to compare the American situation in this respect with that of the great English universities. They in the past have cared far more liberally for the instructor than for the student. The comfortable livings for their fellows were oftentimes quite out

of proportion to the direct service rendered in instruction, however much they may have been earned in the lines of literary or theological research or production. Recent tendencies seem to be quite away from this mediæval practice. A great decrease in the income from tithes or endowment applicable to salaries or livings has been nevertheless accompanied by a notable expansion of the expenditure for scholarship aids. Oxford University thus increased its expenditures for student aid by about $20,000 in the decade from 1883, while its income available for salaries and current expenses lessened by upwards of $50,000 in the same period. In the United States our experience has been quite the opposite. Here in America the first care has been for the student, both by direct gift from private individuals or by State endowments. Donors have expressly stipulated that their gifts should be devoted either to the erection of buildings or to scholarship funds, with the result that the salary lists have been exclusively covered from current income.

It should be borne in mind, moreover,—a fact which is not usually appreciated by those who make gifts to colleges for aid to students,—that each scholarship thus endowed or established often entails a real drain upon the fiscal resources of the institution. For example, the cost per year of each student at the Institute of Technology is approximately $340. The tuition fee is $200. Each scholarship student thus entails a deficit below expenses of $140.

Thus it appears that the very generosity of donors for aid of students often operates to reduce the amount available as compensation to the instructing staff. All of which makes it clear that Mr. Lowell, than whom, as senior member of the Executive Committee of its Corporation, none could be more fully informed of the circumstances, has wisely as well as most generously drawn attention to an urgent need, not alone of the Institute of Technology, but of the colleges and universities of the country as a whole.

A mother of many is reported to have said that no child is interesting until it is three years old. With about the same half-

truth, this might be said of periodicals. The child and the magazine have equally to be shaken into place in the economy of things. However anxious and unpleasant to the mother and to the editors may be the task of shaking, the world takes little interest in the process, judging the infant and the periodical solely by results. The first year of the TECHNOLOGY REVIEW has moulded it into rough promise of what it ought to be, the second should put shape to it, the third some manner of finish, so that at about the age when the average child becomes something else than a nuisance to an unsympathetic world the REVIEW ought also to have arrived at that degree of finality and maturity which shall assure its permanence in the economy of the Massachusetts Institute of Technology.

Meanwhile, however, the REVIEW must be kept alive; and the chief danger to its existence lies in the fact, not that it requires so much, but that it needs so little. There are thousands of Institute men who take at least a dollar's worth of interest in it, and who would be glad, annually, to contribute that sum to its support, especially as that contribution brings to them, in the four handsome numbers, a reward far greater than that with which virtue must ordinarily content itself. These men would be sorry, indeed, to see the periodical expire; but the dollar is so small a sum, it seems so easy to send it at some other time than the present, it is so difficult to decide in what form to send it, that in far too many cases the man who would like to receive the REVIEW does not get it; the REVIEW, which needs his dollar, does not get that: and both suffer thereby wholly needless damage. The main problem, then, of this as of every other periodical, is to establish financial communication between itself and those who would gladly be subscribers to it, could their inertia once be overcome. Barnum, a competent observer of mankind, is said to have declared that, if every fool in the country would pay a quarter at the door of his tents, he would become fabulously rich. *Per contra*, if all the wise Institute men, who really want the REVIEW, would remember to

send a dollar to it, the financial future of that publication would be wholly beyond peradventure. Upon such small deeds does fate hang.

The only known way of establishing such communication is by means of the printed circular or of that obvious fraud, the duplicated personal letter. That being the case, every man of affairs sits, like Cyrano under the falling leaves, in a ceaseless shower of advertising leaflets. To make any impression, a circular must, as the French say, "leap to the eyes." Hence the straining after sensations, the success of the advertising specialist, the phenomenal vogue of that thing, be it good or bad, which has found some new and striking way of making itself seen above the unheeded mass of ordinary wares. But, such means being equally beyond the resources and below the dignity of the REVIEW, it must await the loyalty and zeal of those Institute men who will take the trouble needed, not only to renew their own subscriptions, but to bring the REVIEW before those who ought to be, but who have not yet become subscribers to it. The future of the enterprise lies in their hands.

This question of making one's existence known, or, more bluntly, of advertising, is a curious one as it relates to colleges. Obviously, no such institution may put a broadside in the newspapers or cover the bill-boards with lithographed advertisements. On the other hand, shall a college refrain wholly from making itself known, except through the slow and uncertain channels of its graduates? It may be argued that, since no reputable college is a money-making institution, it has no need to follow in the footsteps of those enterprises which seek pecuniary success. The obvious answer to this is that, while the college may not seek money directly, that commodity is absolutely essential to it, and can be secured only by making the work of the institution not only so successful, but also so well known, as to bring to it either liberal private endowments or the aid of the State or city. A good collegiate

training, especially under modern conditions, costs far more than any one is willing to pay for it. The difference between what the student can and will pay and what his education costs must be made up through public or private charity; and an important business of a college is not only to deserve, but to attract, for the sake of the young persons whom it would train, that charity.

Just at present the residential colleges, where dormitory life permits of a high degree of organization and concentration in sports, find themselves — quite without conscious effort on their part — attracting ample notice through the popular passion for athletic games. The leading contests among these colleges seem, sometimes, to outweigh matters of world-wide moment; and the newspapers, prompt to meet the cravings of the public, fill their daily pages with the minutest details of college and preparatory-school athletics. As, in most instances, the boy himself — however fondly his parents may imagine otherwise — chooses his college, and as to most boys these minutiæ of college sport are of absorbing interest, it is plain that this extended notice, brought about, not by the colleges themselves, but by a public demand, has had not a little effect upon the growth of those educational institutions in which athletic sports receive marked attention.

Quite apart from this matter of attracting popular attention, athletics are valuable to a college from two points of view: they promote college loyalty, which, intangible and often foolish in its manifestations, is, nevertheless, a most necessary cement in the upbuilding of any such institution; and they stimulate among the whole body of youth an interest in gymnastic training. These, it is almost superfluous to say, are ends actively to be sought. The old idea of a college — and here one must distinguish it carefully from a university — as a place for training scholars has given way to the right conception of it as a place for building men. And a man not built as fully and judiciously upon his bodily as upon his intellectual side is but a deformed or unformed creature, handicapped in

whatever he may undertake. This being so, the modern college is bound for its own sake, for the sake of right education, to provide for, to encourage, and even to demand obedience on the part of its students to the now well-understood laws of hygiene in general and of physical exercise in particular.

Such provision and encouragement, however, is expensive, more costly than most colleges can afford. Fortunately, it is exactly at this point that the college can most justly claim the direct aid of its sons. It is just in this matter of physical training that the past student and the present can be brought most closely together. No man can take part in the struggle for subsistence, none can taste of the higher things of life, without at once realizing the enormous advantage of physical health and strength. None better than the graduate can appreciate the needs, on the bodily side, of the undergraduates. Therefore it is that the Walker Memorial Gymnasium has been undertaken. And on the day when that gymnasium is opened there will have been added to the splendid courses of the Institute of Technology a new one, open to all students alike and not less valuable than any other department of scientific study,— a course truly technological, for it will consist of the application of the sciences of physiology and hygiene to the art (the most important of all arts) of healthy living. Whatever money comes to the Institute for other special purposes — for scholarships or for the establishment of courses or professorships — can in the nature of things be of direct benefit to but a small proportion of the students; whatever may go to the building of the proposed gymnasium will benefit every student in the college, throughout his course and throughout his life. Moreover, it will raise the efficiency of the Institute, through the increased physical and mental power of its undergraduates and graduates, more than any of us can now realize. Finally, as a gift for all time from the older men, who are reaping the benefits of the Technology training, to that ever-flowing stream of younger men who are coming under its quickening influences, this Memorial Gymnasium will make for such solidarity and loyalty among Institute men as has not yet been reached.

GENERAL INSTITUTE NEWS

Readers of the REVIEW will have seen with genuine regret the recent announcement of the resignation of President Crafts, communicated in the following letters: —

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
BOSTON, Jan. 1, 1900.

The Executive Committee of the Massachusetts Institute of Technology have to announce to the members of the Corporation the resignation of President Crafts, to take effect at the end of the present school year.

The Executive Committee have found it impossible to induce President Crafts to reconsider his decision, and have accepted his resignation with great regret.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY,
BOSTON, Oct. 24, 1899.

TO THE EXECUTIVE COMMITTEE OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY:

Gentlemen, — I wish to communicate to you my desire to resign the office of President at the expiration of the school year of 1899–1900; and I write at present, in order that you may have due opportunity to consider the choice of a successor.

My reasons for taking this step at this time are founded upon my desire to return to purely scientific occupations. My term in office has shown me the wide field of educational problems, both within and outside the Institute, which should be studied; and I have found that such studies and the performance of administrative duties, although not in themselves burdensome, leave little freedom for the pursuit of experimental science. A choice must be made between administrative and scientific occupations, and it is the latter which I wish to choose.

The office with which you have honored me, perhaps in consequence of my long connection with and interest in the school, has brought me into more intimate relations with the government of this great Institute, with its instructing staff, and with many of its students; and I look with great pleasure to these few years of educational work, and particularly to my participation in the deliberations of the Executive Committee, which have led to close and friendly relations with its members.

All these ties are severed with great reluctance, to return to a field which aroused my early enthusiasm, and which still claims my most active interest.

Yours respectfully,

J. M. CRAFTS.

President Crafts was Professor of Chemistry at the Institute from 1870 to 1875, returning in 1892 to become again Professor of Organic Chemistry. He had thus an intimate knowledge of the early history of the school and a close acquaintance with the work of President Rogers and his associates. On the sudden death of President Walker, in the early days of 1897, the thoughts of the Faculty and the Corporation turned at once, therefore, to Professor Crafts for leadership in time of need. The duties of the chairmanship of the Faculty were assumed by him, although not without much reluctance, long occupation with independent research having made Professor Crafts hesitate to undertake administrative routine. The remainder of that year and the opening of the next passed most successfully, and in October the Corporation unanimously elected Professor Crafts President of the Institute. The two years which have intervened since that time have been eventful, and with all the progress of the school the President has been actively identified. Notable additions have been made to the Institute buildings. President Walker had been much disappointed that plans for the new building had not been put in execution on account of limited funds, but unexpectedly large receipts from the estate of Mr. Henry L. Pierce so increased the resources of the Corporation that the delay proved fortunate in making larger and better buildings possible. At the same time important changes were carried out in all the older buildings, every department of the school gaining relief from previous crowding.

Through the efforts of the President and his associates in presenting the needs of the Institute to the John W. and Belinda Randall Charities Corporation, there has been received from the Randall trustees the gift of $75,000 for the general purposes of the college. In addition, the Institute has been the recipient, during President Crafts's administration, of an unusual number of gifts and bequests,

among them those of Mr. Edward Austin, Mrs. Julia B. H. James, Mr. George A. Gardner, and Mr. Augustus Lowell. It must be a source of peculiar gratification to the President that, through the generosity of Mr. Lowell, there should have been established during his term of office, in such liberal proportions, the beginning of a fund for the benefit of the teaching staff.

The number of changes in the Faculty during his administration has, fortunately, been small, the only death being that of Professor van Daell. Important questions in regard to instruction have, however, required his earnest consideration. The President's report of last year included a statement of negotiations with the authorities of the United States Navy Department in regard to the education of graduates of the Annapolis Naval Academy in naval architecture. Up to the present time these negotiations have not led to a positive result. Among important changes announced this year are included the introduction of the option in heating and ventilation into the course in mechanical engineering, and of landscape architecture as a part of the course in architecture.

While his duties as professor of organic chemistry did not involve contact with large numbers of the students of the earlier years, and the great size of the more recent classes has forbidden personal acquaintance with many of their members, President Crafts has welcomed opportunities to meet Institute men, individually and collectively. Those who have been fortunate enough to be present at the gatherings of the alumni will long remember the delightful combination in his addresses of a rare and fine humor with scientific breadth, deep interest in education, and high ideals for the future of the Institute. In the success of the two more recent alumni undertakings, the TECHNOLOGY REVIEW and the Walker Memorial Gymnasium, President Crafts has taken active and effective interest.

It is a matter of deep regret to Institute men that the President's love of scientific research has proved superior to that for administration, for which his professional reputation, his courteousness, his knowledge of affairs, and his educational experience are such valuable qualifications.

AN ABSTRACT OF THE PRESIDENT'S REPORT

The annual report of the President and Treasurer of the Institute is now in press.

President Crafts opens his report with a reference to recent notable events in the college world. The inauguration of presidents at Amherst, Wellesley, Brown, and Yale, the announcement of educational programmes at those occasions, and in particular a comparison made by President Hadley between professional schools and colleges, have led to a statement in the President's report of the part which is taken by the Institute in the educational efforts of the day.

The President of Yale describes the students of military academies as a homogeneous body of men pursuing a common scheme of studies, with a common end in view, and with rigorous requirements as to work, and says that in colleges the community of interest is less, and the community of hard work is very much less; and he fears that the true spirit of college democracy may pass away under the new form of college life.

It is pointed out in the report that an independent school of applied science also attracts a homogeneous body of students, because selection is brought about by the known fact that this course of study is arduous and demands a mind trained to mathematical discipline, thus operating a selection before entrance; while a prescribed curriculum and a mature understanding of the application of the studies to professional work lead the students to strive constantly toward a common goal.

"*Esprit de corps* in college is succeeded in after-life by the professional spirit with its declared standard of honor and distinctness of purpose, so that in the civil as well as in the military professions men are bound together, and form a disciplined element in the community.

"The subsequent careers of our graduates prove the maintenance of professional spirit, since more than 90 per cent. remain in some sort of scientific occupation. They form part of an army of more than 30,000 engineers, chemists, miners, physicists, and architects,

who are transforming American industries and replacing wasteful guess-work methods by calculations and by trained taste."

The difference between educational work of scientific schools and colleges is described as follows: "Any institution whose fixed course of studies maintains a high educational standard and strengthens a distinct purpose till it is settled for life is doing its true work as a professional school. The college of to-day seems to be accepting another task as its most important function,—that of directing and giving play to scholarly and social tastes."

Attention is called to the tendency which is growing in all professional schools to make their work succeed that of college; and it is stated that in Germany, now that the polytechnic school of Charlottenburg has acquired the right to give the degree of Ph.D., projects are on foot for establishing a technical degree superior to that of the university.

The fitting place for technical schools, whether independent or incorporated with a university, is discussed; and it is noticed that in Europe they are almost always independent, while with us they have usually grown up under the shelter of an old university or as part of a new one. The advantages of independence in handling problems so different from those of the university is pointed out; and we think that it has been illustrated by the history of the Institute, which has had a free development within a great educational centre.

The methods of teaching applied science thus organized have in some branches been more nearly in touch with the demands of the time than in any other country. The report says: "Such governing bodies, unlike ministers of education abroad, have frequently been obliged, not only to decide upon new courses of study, but also to pay for them from their own pockets; and in the Institute each demand has met with a generous response, not only from those of our own government and from our alumni, but also in a very remarkable way from men quite unconnected with us, who have put their wealth in our hands for distribution without reserve or restriction. It is easy to understand that the expenditure of funds

under these conditions should be made with the shrewdness of the best business methods, and economy of production is one of the most notable features of American institutions of higher education, and is sometimes in strong contrast with those of Europe. Former reports have alluded to the attention which American methods of education in science have attracted in Europe; and again this year we have received visits and requests for information from persons charged with the establishment of schools of applied science in England, in Germany, and in Russia."

An account is given of the course of study leading to the degree of Bachelor of Science, and it is held to be at least as broad a programme and more faithfully followed than that leading to the degree in arts under the elective system.

The classical tradition that a council of teachers can provide the best course of studies for a professional career has been adhered to in our scientific schools; and it is said that colleges have now assumed a different task, that of providing with large freedom of choice for scholarly and social tastes. Some of the results of the new collegiate methods are questioned, and it is said that "the choice now made by students under the elective system shows a singular neglect of mathematics, and in particular of physical studies which underlie the greatest achievements of this scientific age."

The considerable accessions to our funds during the last three years have been used to introduce necessary improvements in our courses of instruction; while the claims of students unable to pay our high tuition fee have been met by an increase of about 50 per cent. in the scholarship appropriations, so that they are now $24,000. It has not been thought expedient to reduce the tuition fee, but rather to make the education more valuable. Undoubtedly, the small increase in the number of students, 1,178,— only 8 more than last year,— is affected by the growth of flourishing schools of science with very low tuition fee, in some institutions $15 to $30.

The office of librarian was established ten years ago, and Dr. Bigelow reports the progress made since that time. The library

has grown from 17,545 volumes in 1889 to 50,149 volumes. An excellent room for the general library has been provided, and is much used between hours of lectures. We were among the first to divide our books among the departments for more convenient use, and some of our departmental libraries stand among the first in the world. According to the lists in *Minerva*, we come fifth in numbers of books among the European technical libraries. The value of our libraries is estimated at $112,866. This year 3,438 volumes have been added.

At the solicitation of the United States Commissioners, and also of the Massachusetts State Board, we have sent an exhibit to Paris. Many new photographs have been taken, which, together with engineering and architectural drawings and explanatory texts, will give a good presentation of the work of the school, and form a permanent record of our standing in 1900.

A new option in Landscape Architecture has been planned to diverge from the architectural course in the second year. A principal feature is a course of studies in Horticulture, extending through three years. The position of the Institute offers unrivalled opportunities for these studies; for we are within easy reach of the Arnold Arboretum, which, under the direction of Mr. Charles S. Sargent, has become known throughout the world for its tree and plant culture. The lectures on Landscape Architecture will be given by Mr. Guy Lowell, 1894, who has recently received the diploma of the École des Beaux Arts, and who has made a special study of the subject in Europe.

An option in Heating and Ventilation has been added to the Mechanical Engineering Department in consequence of a recognized demand for this special work. It will be under the charge of Professor Woodbridge, whose thorough theoretical knowledge and large practice have given him the best preparation for this work.

Few changes are reported from the different departments. The Mathematical Library has been named the Runkle Library; and it is now enriched with the gift of President Runkle's private library of 450 volumes upon mathematics and astronomy, besides pamphlets.

Professor Burton is to take charge of an expedition to Georgia, to observe the total eclipse of the sun of May 28. New arrangements and enlarged quarters have enabled the Mining Department to deal successfully with the greatly increased number of students in the classes. The Summer School of Architecture under Professor Homer visited Italy and France.

Some imperfections in the ventilation of the new third year laboratories in the Walker Building have been remedied by use of an electric fan. Dr. Thorp, thanks to a fund provided by Mr. Samuel Cabot, was enabled to make a tour of inspection this summer, visiting the most important chemical works of England, France, and Germany.

The Physical Laboratories have acquired several important pieces of apparatus, and the enlarged space allotted to Heat Measurements has allowed of much improvement in the instruction.

The Biological and Geological Departments, removed last year to the Henry L. Pierce Building, report greater facilities for work in larger quarters.

Professor Sumner has given a new option in the Politics of Eastern Asia, which touches on questions regarding our colonial possessions.

CORPORATION NOTES

The 278th meeting of the Corporation was held October 4. Dr. Francis H. Williams was re-elected Secretary, and Colonel T. L. Livermore member of the Executive Committee for five years. Mr. John E. Hudson, a new member of the Corporation, was added to the Visiting Committee on Physics and Electrical Engineering. A memorial of Mr. Samuel Johnson was presented.

The 279th meeting was held December 13. The time was occupied largely with the presentation of the annual reports of the President and the Treasurer. An abstract of the President's report will be found elsewhere in this number. The Treasurer's report enumerates the gifts received during the year, most of which have already been noted in the present and previous numbers of the

REVIEW. It is shown that, while the income of investments for general purposes has been increased by more than $11,000, this has been nearly offset by advances of salary, the final result being an adverse balance of more than $19,000. On the other hand, there has been a nearly equal gain on securities sold. The property of the Institute has been increased during the year by more than $437,000, of which only a fraction, however, is available for general purposes.

THE INSTRUCTING STAFF

Besides appointments announced in the October number, the following changes have been made: Lieutenant James Hamilton has been detailed by the War Department, and appointed Assistant Professor of Military Science. Lieutenant Hamilton graduated from the U.S. Military Academy at West Point in 1890, and has recently resigned from military service and taken up the practice of law in Boston.

Messrs. Edward M. Bragg, Frederick L. Edmands, George M. Holman, Elbridge C. Jacobs, Areli H. Jacoby, Carleton S. Koch, Lewis J. Seidensticker, Percy G. Stiles, and Robert G. Valentine, Assistants of last year, have terminated their connection with the Institute.

Mr. Jacobs has been appointed Instructor in Chemistry and Mineralogy at the University of Vermont. Mr. Stiles is pursuing advanced studies at Johns Hopkins University. Mr. Seidensticker has gone to a sugar plantation near Cienfuegos, Cuba; and the others have engaged in various lines of professional work. To fill these and other vacancies, the following additional Assistants have been appointed: Charles W. Berry, '95, in Mechanical Engineering; Fred E. Busby, '97, in Industrial Chemistry; W. D. Coolidge, '96, in Physics; Harrison W. Hayward, '95, in Mechanical Engineering; William S. Newell, '99, in Mechanical Engineering; George H. Priest, '99, in Oil and Gas Analysis; George H. Riker, '99, in Mechanical Drawing; Norman E. Seavey, '99, in Physics; Frank R. Swift, '99, in Mechanical Engineering; Charles-Edward A. Winslow, '99, in Biology. Mr. William

Skarstrom has been appointed Instructor in Gymnastics in place of H. J. Boos, resigned.

TEACHERS AND LECTURERS FOR THE YEAR

Messrs. Edward P. North, A. H. Sabin, F. G. Stantial, and C. Howard Walker do not continue their lectures the present year. New appointments are as follows: Gary N. Calkins, Ph.D., on protozoa inhabiting water supplies; Charles M. Green, on electric arc lighting; F. M. Green, U.S.N., on longitude determinations; Simeon C. Keith, Jr., S.B., on bacteriology of milk products; Walter H. Kilham, S.B., on history of ornament; Guy Lowell, A.B., S.B., graduate École des Beaux Arts, on landscape gardening; H. G. Prout, on the future of the railroad engineer; Theodore H. Skinner, S.B., on architectural design; George W. Tillson, S.B., on the construction of city pavements; Albert L. Webster, on the drainage of high office buildings; Jasper Whiting, S.B., on cement manufacture; S. W. Wilder, Jr., S.B., on alumina and alumina compounds; Joseph Willard, LL.B., on business law.

PROFESSOR LUQUIENS

The following memorial of Professor Luquiens was adopted by the Faculty November 1: —

Coming to the Institute in 1874, he brought to the service of the Department of Modern Languages the energies of a most able, faithful, and conscientious teacher and of a ripe scholar in a field much more extensive than that of modern languages alone. Besides the valuable work done by him in the modern languages and literature, he had already received the degree of Ph.D. from Yale University, especially for work in Sanskrit, and had made researches and published papers on the Sanskrit and Persian languages and literature, which were recognized by those versed in the Oriental languages as valuable contributions to the study of ancient Persian literature. He was connected with the Department of Modern Languages of the Institute, successively, in the capacity of Instructor, Assistant Professor, Associate Professor, and Professor, until 1892, when he left to assume the Professorship of Modern Languages, and subsequently that of the Romance Languages and Literatures, at Yale University.

His superb scholarship, his special adaptation to explain a literature, his great ability, industry, and conscientiousness as a teacher, and his sterling qualities as a man commanded the universal respect and affectionate regard of his students and of his colleagues. It is, therefore,

Resolved, That in the death of Professor Luquiens we recognize the loss to the community of a most distinguished and able scholar, of a most successful teacher, and of a man of sterling qualities, who was held by us in the highest esteem.

Resolved, That, much as we deplore his death, we feel grateful for the fact that the influence of his writings, of his teaching, and of his life, will survive in the lives of his numerous pupils and friends.

Resolved, That we extend our deepest sympathy to his bereaved family.

Voted, That these resolutions be spread upon our records, and that a copy of them be sent to Mrs. Luquiens.

PARIS EXPOSITION

An appropriation has been made for an Institute exhibit at the Paris Exposition. The United States Commissioners have assigned different educational departments to one or two institutions each. The Institute shares with Cornell University the important and honorable responsibility of representing education in engineering and architecture. The space available would not in any case admit of adequate treatment of all departments, but our work in these lines will be presented with some degree of completeness. For this purpose we are assigned three wing frames and excellent wall space for architectural designs. Portfolios combining text and photographs, as well as portfolios of drawings, will be prepared on the same general plan as those used at Chicago. Besides the usual Institute publications, there will be small guides to the exhibit in French and in English. Professor Burton is preparing, with the head of the architectural department, a plan showing the location of Institute buildings, and of other important public buildings in this vicinity. The photographic work is under the direction of Professor Lawrence, and the large number of existing negatives will be considerably increased to show recent progress. It is hoped that the number of Institute men in Paris may lead, in connection with

the Exposition, to some sort of informal organization for mutual advantage, with pleasant possibilities for Institute men visiting the city during the Exposition or later.

CHARTS FOR THE PARIS EXPOSITION

The Economic Department has a force of draughtsmen engaged in preparing charts for the Paris Exposition, to be shown in connection with the educational exhibit of the United States. Some of the draughtsmen have been at work since the first of the summer. One series consists of twenty charts that are being prepared for the department of social economics of the United States. These are prepared from data furnished by the United States Bureau of Education, and will represent facts concerning the age and sex of the school population, and the numbers of teachers and students in the different classes of the colleges and professional schools throughout the country. These charts will hang over the educational exhibit.

Dr. Dewey has under his supervision also the preparation of another series of about one hundred charts for the Massachusetts Commission having in charge the State exhibit. These charts present facts concerning the statistics of the State Board of Health, the various charitable institutions and savings-banks, and the different economic institutions of the State. The charts will be hung in frames, together with mounted photographs of each institution. The series will be turned over to Mr. Walter S. Allen (M. I. T. '79) of the Massachusetts Commission on the Paris Exposition.

SCHOLARSHIPS

The munificent bequest of Mr. Edward Austin has enabled the Institute not only to enlarge the opportunities open to its own teachers and graduates for advanced study at the Institute or elsewhere, but has this year placed it in a position to provide for a larger number of applicants than ever before. The total amount of awards for the present year is not less than $23,200. This amount is distributed among 175 applicants, making an average

of about $130 each. It is probable that, as time passes, there will be more and more opportunities for applying the income of this fund to the aid of advanced students; and it seems unnecessary that the amount now available for undergraduate scholarships should be materially increased for the present number of students.

LOCATION OF THE INSTITUTE

In view of imaginative newspaper statements, it will be of interest to Institute men to learn that the question of removal from the present excellent location is not under consideration by the Corporation. It is desirable to increase the land now available for building purposes, but any removal to a suburban site is only a remote contingency of the future.

STATISTICS

The total registration for the present year is 1,178, continuing the remarkable state of equilibrium between gains and losses of students since 1893. During this period of seven years the extremes of registration have been 1,157 and 1,198. Even within the several classes and courses the constancy is almost as complete. The total numbers by courses of regular students above the first year indicate still a slight drift upward in Mining Engineering and Naval Architecture, downward in Architecture and Electrical Engineering. The number of students from foreign countries the present year is twenty-six. Last year it was twenty-seven. European countries included in the list are Denmark, England, France, Germany, Russia, and Turkey. The number of graduates of other colleges is notably increased from sixty-eight to eighty-one, including seventeen from Harvard. The number of women students is fifty-three, in comparison with forty-seven last year and sixty-nine the year before. In connection with the table of graduates it is interesting to notice that accessions to the class of '98 have now brought its membership up to two hundred, which is likely to remain a high-water mark for some time to come.

STUDENTS FROM OTHER COLLEGES

Every year at the Massachusetts Institute of Technology a considerable portion of the students entering is made up of those who have graduated from or have studied at colleges or universities. These students are usually prepared to begin immediately upon the professional work of the course which they choose.

This year there are in all fifty-two such students, of whom thirteen are from Harvard. Nine are graduates of Harvard, five of Brown, three of Yale, and two of Amherst; while the following institutions are represented on the list of students by a single graduate each: California, Columbia, Cornell, McGill, Maine, Michigan, Minnesota, North Carolina, Princeton, Rochester, Southern Presbyterian, and Vermont Universities, Acadia, Beloit, Bowdoin, Colorado, Dartmouth, Lafayette, Robert (of Constantinople), Randolph, Macon, and St. Joseph's Colleges, Worcester Polytechnic Institute, and the Académie de Neufchâtel.

A group of eleven of these students has entered the course in electrical engineering, the next largest, a group of nine, that in chemistry, while the courses in civil, mechanical, and mining engineering, have each been chosen by six college students. A considerable proportion have entered the courses of architecture and sanitary engineering.

GYMNASIUM FOR WOMEN STUDENTS

The latest of the many recent additions to the Massachusetts Institute of Technology is a new and complete gymnasium for the use of the women students. For several years the men have been provided for in the line of physical training and instruction at the gymnasium on Exeter Street; and plans are now in progress for the erection of the Walker Memorial Gymnasium, to supersede this old one. The opening of the women's gymnasium, however, is the first step that has ever been taken at the Institute toward providing for the physical culture of women students.

When the arrangement of rooms in the recently erected Pierce

Building was before the Faculty, it was decided to set aside a room to be used for gymnasium purposes by the women; but no such idea as the establishment of a regular gymnasium was thought of at that time. Last year, by the will of the late Miss Marion Hovey, the Institute received substantial aid for the purpose; and it was decided to have the gymnasium fitted up for the use at the beginning of the present college year. Owing to the delay occasioned by the construction of some of the necessary apparatus, which did not arrive until last week, it was found impracticable to open the gymnasium until November. The new gymnasium is located on the first floor of the Pierce Building, and opens from the Margaret Cheney Room, an attractive room reserved for the use of the women students. The gymnasium is of modest, unassuming proportions, and is supplied with apparatus in reasonable abundance, which is carefully and methodically arranged so as to prevent overcrowding and yet leave plenty of room for free exercising and class work.

THE SOCIETY OF ARTS

The Society of Arts has read at its regular meetings, held this season, the following papers: "Some Practical Applications of the Storage Battery," by Mr. J. L. Woodbridge; "Visual Signals," by Mr. H. C. Spaulding; "Use of Kites to obtain Meteorological Data," by Mr. A. Lawrence Rotch, Director Blue Hill Observatory; "New Cellulose Industries," by Mr. A. D. Little; "The Character and Extent of Food and Drug Adulteration in Massachusetts and the System of Inspection of the State Board of Health," by Mr. Albert E. Leach, Analyst.

At the fifth meeting the society met in the Henry L. Pierce Building, and was told about the collections made by the Geological Department of the Institute, with the Commissioners of Massachusetts and the United States, for the Paris Exposition. Remarks were made by Professor Niles, Professor Crosby, and Mr. Fuller. After viewing the collections which were on exhibition, the members present were invited by the department to light refreshments served in the Margaret Cheney Rooms.

THE UNDERGRADUATES

CLASS OFFICERS.

The Senior, Junior, and Freshman classes have elected officers as follows: —

Senior Class.— C. M. Leonard, of Chicago, president; W. A. Dorey, of Cincinnati, first vice-president; F. D. Chase, of Chicago, second vice-president; S. C. Sears, of Winthrop, secretary; J. H. Bacheller, of Charlestown, treasurer; G. E. Russell, of Woburn, director; R. H. Clary, of Seattle, Wash., H. D. Jouett, of Somerville, Institute Committee.

Junior Class.— V. F. Holmes, Copenhagen, Denmark, president; Ray Murray, London, England, first vice-president; E. Seaver, Jr., Roxbury, second vice-president; F. W. Puckey, Wilkesbarre, Pa., secretary; A. W. Rowe, Gloucester, treasurer. Executive Committee: W. W. Walcott, of Natick; O. H. Perry, of Lowell. Institute Committee: E. G. Thatcher, Middletown, Conn.; W. Whipple.

Freshman Class.— R. M. Field, of Brooklyn, president; L. H. Lee, of Buffalo, first vice-president; J. T. Cheney, of Kenilworth, Ill., second vice-president; E. W. Howell, of Boston, secretary; C. J. McIntosh, of Racine, Wis., treasurer; H. T. Winchester, of Dorchester, Board of Directors; F. G. Babcock, of Tolland, Conn., Institute Committee.

THE WALKER CLUB.

The Walker Club has organized, with H. H. Howe, of Boston, W. W. Dow, of Malden, R. B. Lowe, and Professor C. F. A. Currier as Executive Committee; J. S. Bronson, of Nashville, Tenn., secretary and treasurer. W. W. Dow was elected manager of the play to be produced in Junior week. The committee on the selection of the play consists of Professor Arlo Bates, J. P. Draper, of Canton, E. H. Davis, of Hyde Park.

The Club has recently hung a large, richly framed photograph of General Walker in the political science library. This was done by private subscription among the club members and as a tribute to the memory of General Walker. The meetings this year have been unusually interesting. Mr. James P. Munroe and Professor Peabody have addressed the Club, and have contributed much to the knowledge of the Club by very instructive and entertaining talks. The meetings are being made more of a feature of the club life this year; and a strong effort is being made to bring the instructing members and the students in the Club into a close personal contact, which shall enable the undergraduate members to catch some of the force and enthusiasm of the men who instruct them.

MUSICAL CLUBS

The officers of the Musical Clubs for this year are president, Mortimer Bristol Foster, '01; vice-president, Harry Leslie Walker, '00; secretary, John Stanard Bronson; treasurer and assistant manager, Arthur Harold Sawyer, '02; manager, Henry Norman Hudson, '01.

The Club this year has been successful with its concerts. The first one was given in the Unitarian church, West Newton, November 17. After the concert light refreshments were served, and dancing followed.

On December 14 the Club gave a concert in Stoneham for the High School. The home concert was held on December 20. On December 26 the Clubs went to Lowell, and on the 28th to Gloucester. At both these concerts there was dancing after the music.

The Clubs are somewhat larger this season than last year, and their work is better. The concerts announced for next term are: February 16 at Reading; February 27, Everett Y. M. C. A.; March 1, Cambridge Y. M. C. A.; March 10, Colonial Club, Cambridge; March 30 at Boston Y. M. C. A.; April 25, spring concert and dance.

ATHLETICS

As President Crafts quoted General Walker in saying that in our professional schools it may not be best to play football or other college games for the sake of winning, but merely for the exercise and pleasure derived from the game, our football scores for the fall of 1899 do not seem so discouraging.

Games were played with the New Hampshire State College at Durham, N.H., with Boston College at Boston, with Exeter at Exeter, with Wesleyan at Middletown, with Tufts at Somerville, with Worcester Tech at Worcester, with Amherst at Amherst, with Tufts at Boston, and with Brown University at Providence.

ATHLETIC MEET

The annual Winter Indoor Meet of the Massachusetts Institute of Technology Athletic Association was held in the gymnasium on Exeter Street, over 300 being present.

The class team race was the most exciting event of the evening. It was run in four straight-away relays, of 35 yards each, by four men from each class. Two men from each class were stationed at each end of the gymnasium; and, when a man completed the 35 yards, he touched his team mate off for the dash back. '00 took the lead with its first man. McMaster and each successive man increased the lead; but on the last relay Pope, of '02, crept up even with Hull, of '00, the finish being a dead heat. A second heat was then run between '00 and '02, Pope, '02, winning on the final relay from Wentworth, '00, by about four inches.

The 35-yard hurdles proved very interesting, and two of the heats were very close. The points were divided, so that the class of '00 won four points in this event, the class of '03 four points, the class of '02 taking the remaining point.

SUMMARY

THIRTY-FIVE YARD DASH.—First heat won by Brown, '02; second, Wentworth, '00. Time, 4 2-5 sec. Second heat won by Hall, '00; second, Lowe, '02. Time, 4 1-5 sec. Third heat won by McMasters,

'00; second, Lord, '03. Time, 4 2-5 sec. Fourth heat won by Calley, '03; second, Maxson, '01. Time, 4 3-5 sec. Heat for second men won by Wentworth, '00; second, Maxson, '01. Time, 4 3-5 sec. Final heat won by Wentworth, '00; second, Hall, '00; third, Brown, '02. Time, 4 2-5 sec.

THIRTY-FIVE YARD HURDLES.— First heat won by Wentworth, '00; second, Baker, '02. Time, 4 4-5 sec. Second heat won by Pope, '02; second, Magnitzsky, '03. Time, 5 sec. Third heat won by Calley, '03; second, Rowe, '01. Time, 5 1-5 sec. Heat for second men won by Baker, '02; second, Rowe, '01. Time, 4 4-5 sec. Final heat, Wentworth, '00, and Calley, '03, dead heat; third, Pope, '02. Time, 4 4-5 sec.

STANDING BROAD JUMP.— Won by Baxter, '01, distance, 9 ft. 9 1-4 in.; second, Wilder, '01, distance 9 ft. 4 1-4 in.; third, Sawyer, '02, distance 9 ft. 2 1-4 in.

RUNNING HIGH JUMP.— Won by Baxter, '01, height 5 ft. 8 3-4 in.; second, Wentworth, '00, height 5 ft. 6 in.; third, Pope, '02, height 5 ft. 4 3-4 in.

FENCE VAULT.— Won by McMaster, '00, height 6 ft. 4 1-2 in.; second, Conant, '00; third, Baxter, '01.

SHOT PUT.— Won by McDonald, '01, distance 36 ft. 2 1-2 in.; second, Winchester, '03, distance 34 ft. 10 1-4 in.; third, Crane, '02, distance 33 ft. 10 1-2 in.

POTATO RACE.— First heat won by Pope, '02, time 38 2-5 sec.; second, Lord, '03. Final heat won by McMaster, '00, time 38 sec.; second, Pope, '02; third, Baker, '02.

RELAY RACE.— Won by 1902 (team, Pope, Avery, Sawyer, Brown); second, 1900 (team: Hall, Wentworth, Grant, McMaster). Time, 18 sec. flat.

TABLE OF POINTS

Event	*'00*	*'01*	*'02*	*'03*
35-yard Dash	8		1	
35-yard Hurdles	4		1	4
Potato Race	5		4	
Running High Jump	3	5	1	
Standing Broad Jump		8	1	
Fence Vault	8	1		
Shot put		5	1	3
Totals	28	19	9	7

THE GRADUATES

REPORT OF WALKER MEMORIAL GYMNASIUM COMMITTEE

BOSTON, December 29, 1899.

Mr. President, Ladies and Gentlemen,— The Walker Memorial Gymnasium Committee appointed last year submits its first report of progress. The committee would be glad if the progress made had been greater; but, in its judgment, enough has been accomplished to justify some degree of satisfaction in the past and confidence as to the future.

The nomination of the committee was far from simple on account of the importance of representing a constituency of so wide a range, and the limited leisure of the members likely to be most efficient. The patience and good will of President Miller ultimately overcame these difficulties; but our first meeting was not held until March 4, and permanent organization was not effected until April. Much of the spring was devoted to the important task of planning our work, organizing the needful co-operation, preparing circulars, etc.

The main principles finally adopted by the committee for its canvass were briefly: —

1. To reach, if possible, every former student of the Institute.

2. To make special efforts to secure early subscriptions of $500 or $1,000.

3. To enlist the co-operation of class and local society representatives in such a way as to lighten the individual burden of labor and to give the appeal a personal quality.

4. To enlist the interest of Corporation, Faculty, and undergraduates as well as of alumni.

Triplicate typewritten lists were prepared of all former students by classes, from the Institute card catalogue. The secretary of each graduate class was requested to serve as an associate member of our committee or to nominate some other member of the class

for that purpose. Each associate member was supplied with a typewritten list of his class, and envelopes addressed to them containing the committee's general statement, subscription blanks, etc.

The results of the committee's efforts may be summarized as follows: —

The Corporation, through its Executive Committee, and the Faculty have appointed committees for conference with our own.

It has been difficult to obtain large subscriptions at the outset; but, aided by the generous example of certain members, we have secured eight subscriptions of $500 or $1,000 besides the $600 due to the very successful work of the Walker Club of undergraduates in producing the English play in Junior Week.

Our efforts to secure co-operation have borne good fruit. Nearly every graduate class has been represented by an associate member of our committee; and at many of our meetings a large proportion of these associates have been present, keeping us in close touch with alumni opinion, and enabling us to assist, by comparison of notes, in meeting the serious difficulties attending the execution of our plans. In the large classes of recent years it became necessary to assist the associates by appointing a considerable number of canvassers to aid in the actual work of securing subscriptions.

We have received from 238 persons subscriptions amounting to $20,860.10. Classified by amounts, we have received: 8 of $500 or over; 17 of from $200 to $500; 43 of from $100 to $200; 170 of less than $100.

Many of our subscribers have preferred not to state the amounts they expect to pay in future years, but have assured us that more will be given.

After careful consideration of a plan for an athletic field at a considerable distance from the Institute, it was voted not to recommend its purchase. The more fully the question of location has been discussed, the more complete has become the conviction of the committee that the Memorial Gymnasium should be in close proximity to the Institute buildings, and that for such proximity ground area can to some extent be sacrificed. The committee

recognizes fully that it can only ask the Corporation to assign costly land to this purpose by securing as large a subscription as possible.

In the report of last year, which led to the appointment of this committee, an attempt was made to present the general considerations which should lead Institute men to co-operate in this great and honorable undertaking. May we ask your further attention to some of these matters in the light of the experience we have gained during the year? The points to be emphasized may, for the sake of definiteness, be formulated as follows: —

1. We entertain no doubt that our general plan is entirely practicable; that $100,000 is not too much to be asked from Institute men, that it is not too little to insure the fulfilment of our expressed purpose,— the erection and equipment of a memorial gymnasium.

2. We are convinced that, while many details must await future determination, the proposed memorial is the best possible.

3. We believe that the obligation to co-operate in this undertaking is one which all Institute men owe not less to themselves than to the Institute and to the memory of President Walker.

As to the capacity of Institute men to contribute $100,000, it seems to us that, if the question needs answering at all, a negative answer would be absurd. There are more than two thousand living graduates. There are at least as many, and probably more, non-graduates who, from their length of connection with the Institute and their degree of interest, may as fairly be reckoned among our constituents. If these four thousand, making every allowance for individual inability and age, are not able to contribute on an average five dollars a year for five years, then the professional success of Institute men is not what it is well known to be by all of us and by the public at large. To fail to do this would discredit us.

The question of the adequacy of $100,000, if secured, to the concrete undertaking in question is, we admit, one of real difficulty. The value of land within easy access is very high, and is continually rising. The gymnasium must be within easy access,

in order to meet the needs of the largest number of students and in order to constitute a fitting memorial. It must be clear, however, that the present state of affairs, with a low building covering a large area upon leased land of high value, cannot be of long duration; that, whenever a change has to be made, the Corporation will have to meet the question of location and high price of land; that the natural solution would be either to use relatively cheap land, such as that on Garrison Street, or to use one or more floors of a high building, perhaps in the vicinity of our present Trinity Place buildings, or to build a high gymnasium with a small ground area. Any one of these plans would involve a large outlay, which cannot be avoided without conflict with the present accepted views in regard to the physical interests of the students.

It is, in our judgment, this situation of the Institute which offers an altogether exceptional opportunity to its alumni. The $100,000 which we have to secure is, of course, not adequate for land, building, and maintenance of any gymnasium worthy of the Institute or of being called a memorial to President Walker. But $100,000 may be immensely helpful to the Corporation of the Institute in the erection of a new building, and may turn the scale between a building limited by the temporary financial capacity of the Institute treasury and a far better gymnasium, such as would satisfy Corporation, alumni, and undergraduates. It would not, of course, be fitting for the alumni to expect the Corporation to apply in the direction of a new gymnasium or its maintenance funds needed for still more important purposes. It is not, on the other hand, to be supposed that the Institute treasury should merely escape otherwise unavoidable expense by reason of our subscription. What we hope for is earnest co-operation in which the Institute shall do all it can and the alumni shall do all they can, and the result shall be better than either could accomplish alone, and a worthy memorial of our President. The precise terms of the co-operation are not capable of definition in advance, and were wisely left by vote of the Association to future agreement with the Corporation.

We may touch briefly upon some of the more personal considerations belonging to this question, although we realize that each

man's conscientious judgment of his own action is to be respected as final. It may be a pleasure for some of us to recall that, in helping the Institute thus, we are in a sense repaying to future students something of what we have gained from former benefaction. The Institute, like most colleges, is not merely an educational institution; but it is a public charity of the highest type. Aside from those who receive the whole or a part of their education from scholarship funds, each student pays the Institute for tuition not much more than one-half its actual cost.

Over and above all else stands the memorial element in our undertaking. The Institute had the great good fortune to have President Walker at its head during the best years of his life. The great majority of us knew him personally, and are by that fact broader and better. The enrichment of student life by a good gymnasium with opportunities for other proper social purposes is one of the things in which he would have taken the warmest interest. Shall we not see that his ideals and his name thus live?

He gives twice who gives quickly. Some wait for others, being doubtful as to the scale of contributions. If all hesitated, our work would be paralyzed. We owe much to the generous faith of a few who have been willing to lead the way. We appeal now to every man in every class not to let a few bear the burden longer, but to do his share, whether large or small.

It remains, Mr. President, to say a few words as to the future of our work. Interesting and difficult questions can hardly be separated from the subscription work with which we are charged. These relate mainly to the location and the character of the gymnasium. As to both, we must repeat that authority rests wholly in the government of the Institute. We have decided views and strong preferences, which are, so far as we know, not at variance with those of the Corporation and Faculty, but are not within their present means. The weight which will be given our opinions will depend largely upon the extent to which you support them by your contributions. We believe that the gymnasium should be very near the other buildings, that it should be of simple but dignified architecture, that it should be planned for future and

not merely for present needs, that it should be not only a place for physical exercise, but should by means of reading-rooms, society-rooms, offices, etc., concentrate a wide range of student interests. All this costs. If you believe in it, we count on your support. To these general questions, and others which it would be premature to state at this time, your committee must give earnest consideration. We shall welcome expressions of opinion from other Institute men who appreciate justly the considerations involved, and shall hope in our next report to show progress on these lines. For the present we desire to mark the position we have reached by presenting for your action the following votes, stated in substance in the call for this meeting: —

Voted, That the Walker Memorial Gymnasium Committee be authorized to confer with the Corporation of the Institute, in behalf of the Association, in regard to the purchase of suitable land for the gymnasium.

Voted, That it is the sense of the Association that the Walker Memorial Gymnasium should include, if possible, provision for other social objects, with a view to the promotion among the students generally of a closer attachment for each other and for the Institute.

The above votes were passed unanimously.

THE WASHINGTON SOCIETY OF MASSACHUSETTS INSTITUTE TECHNOLOGY

The Washington Society of the Massachusetts Institute of Technology held its second informal dinner on December 9 last. The following were present: A. E. Adams, R. E. Bakenhus, '96; F. E. L. Beal, '71; T. B. Booth, '95; H. P. Browne, '96; Winthrop Cole, '87; Edward Collins, '88; A. V. Curtis, '97; P. L. Dougherty, '97; F. L. Edmands, '97; A. W. Grosvenor, '98; L. F. Hewins, '98; S. A. Hooker, '98; T. M. Keene, '91; C. E. Lord, '98; F. E. Matthes, '95; G. H. Matthes, '95; F. H. Newell, '85; A. L. Parsons, '97; A. W. Proctor, '99; William J. Rich, '84; F. T. Schneider, '92; W. W. Stevens, '98; J. E. Woodwell, '96; J. E. Wright, '72.

The first annual meeting, the society having been organized

February, 1899, was held immediately after the dinner. Officers for the ensuing year were elected as follows: president, F. H. Newell, 85; vice-president, H. A. Pressey, '96; secretary, R. E. Bakenhus, '96; treasurer, A. W. Proctor, '99; member of Executive Committee (in addition to the above), F. E. L. Beal, '71.

The society has continued to prosper, owing to the mutual interest which Institute men feel in one another. Great pleasure is derived from the occasional gatherings, and it is planned to have them more frequently during the coming year. The meeting of December 9 was the largest so far held. The society has lost a few members, due to removal from Washington; but about double the number of new men have arrived. Tech men who visit Washington or who expect to reside there are invited to communicate with the officers of the society, as there is a "Committee on Hospitality," whose function it is to entertain such Tech men as far as possible and enable them to meet other Tech men of this vicinity.

It is expected that a sheet of additions and changes for the directory of the society will soon be issued, in order to make this little pamphlet correct to date.

NORTH-WESTERN ALUMNI ASSOCIATION

The annual banquet of the North-western Association will be held in Chicago at the University Club early in February. The Association holds regular meetings on the 16th of each month. At the December meeting Mr. C. E. Woods, President of the Woods Electric Vehicle Company, talked on the status and future of the automobile, and illustrated his remarks with apparatus used in the equipment of electric vehicles.

THE TECHNOLOGY CLUB

On October 9 the annual meeting of the Technology Club was held; the report of the Nominating Committee was accepted, and the following officers were elected: secretary, Walter Hum-

phreys, '97; treasurer, Walter E. Piper, '94; members of the council for three years, Albert F. Bemis, '93, Frank L. Locke, '86, Edward G. Thomas, '87, Edwin C. Miller, '79, and George W. Sherman, '94.

Immediately after the meeting the council met, and elected James P. Munroe, '82, president, and Francis H. Williams, '73, vice-president.

Several smoke talks have been held during this season. On the evening of November 3 the first one was given, at which Mr. Howard A. Carson, '69, spoke on "Some Things seen by an Engineer during an Excursion in Egypt." It was illustrated by the stereopticon. On the evening of November 17 a second talk was given by Mr. Edwin S. Crandon, financial editor of the Boston *Transcript*, who spoke on "Old Boston, England." The third talk was given November 24 by Dr. Henry A. Wolff, of New York, who was for sixteen years a resident of the Transvaal and a member of the Johannesburg Reform Committee; and he spoke of the "Transvaal and the Present Crisis." On Thursday evening, December 7, a talk was given by Mrs. Mabel Loomis Todd on a "Trip to Esashi," a spot twelve hundred miles north of Yokohama, in a region never before visited by a foreign woman. It was Ladies' Night, and many applications for tickets had to be refused because of the large demand and comparatively small seating capacity of the reception-room. On Wednesday evening, December 27, the club entertained very informally the American Historical Society — meeting in Boston — at a smoker, where Welsh rarebit was served to the one hundred and seventy-five guests. On Wednesday evening, January 3, the fifth talk of the season was held. Professor Arlo Bates spoke on "Anglo-Saxon Natural Science."

NEWS FROM THE CLASSES

1868.

PROF. R. H. RICHARDS, *Sec.*
Mass. Inst. Technology, Boston.

Whitney Conant was in Boston recently. He still makes his home at Long Branch, N.J., where he is manager of the water company and vice-president of the Citizens' Bank. — B. P. Tilden in the spring of 1881 entered the service of the Northern Pacific Railroad, and remained with them until 1892; then spent one year with the "Soo." During those twelve years he was mostly engaged in general railroad engineering and construction; had many enjoyable situations to work in, as, for instance, Yellowstone Park, Lake Chelan, and Columbia River regions, in Washington, and several other interesting trips among the Rocky and Cascade Mountains. Altogether a grand experience, and profitable. In 1882 he married, and settled in Jamestown, N.D., which is now his home. Of course, no one could be city engineer but him; and, while resident there, he has had the pleasure of seeing proper sewerage system inaugurated and partially developed, and a water works system, the supply coming from two of the noted North Dakota artesian wells,— they are about fifteen hundred feet deep,— one a three-inch and the other a six-inch tube. The latter is just completed. In 1895 he entered the office of the United States Surveyor-general of that State, in general charge of the draughting and surveying work; became a regular civil service employee under the executive order without having to pass an examination.

1869.

H. A. CARSON, *Rep.*
20 Beacon Street, Boston.

William H. Baker, I., has gone into the insurance business at his home at Fitchburg, Mass.

1870.

PROF. CHARLES R. CROSS, *Sec.*
Mass. Inst. Technology, Boston.

In a letter to a classmate Sampson D. Mason writes:

"After graduation I went West, and was connected with the construction of several unimportant railroads in Michigan and Indiana. In 1880 I was fortunate in being employed by the Northern Pacific, then just entering upon a lease of new life and pushing its road westward from the Missouri River. The Western headquarters are at St. Paul, Minn., the home of our classmate, S. M. Cary, dealer in railway supplies, a business closely allied to railroad building, and which resulted in bringing us into exceedingly pleasant relations. Among the number of Institute men who were prominently connected with the building of the Northern Pacific are Tilden, '68; Weeks, '71; Shailer, '73; Howe, '79 (recently become a Benedict); and Horn, '88. The latter is now one of the division superintendents. In 1892 I was sent to Tacoma as representative of the Purchasing Department on the Pacific Coast. It was with great reluctance that I left St. Paul, for the State of Washington at that time presented few charms; and I made up my mind to never be happy again. I left the Northern Pacific in 1897, and at present am on one of the most beautiful islands in Puget Sound, superintending building modern fortifications under the United States engineers. A magnificent body of water rolls around us, capable of floating all the navies in the world, and, probably, the merchant marine as well. The broad strait of Juan de Fuca, twenty miles wide, opens direct to the ocean; and in clear weather the queen's dominions can be seen in the north-west. This Whidby Island is at the entrance to Puget Sound, or 'Whulge,' as the native Indian terms it. It is five miles across to the main land, where other strong forts are being built; and to a non-military man the entrance seems impregnably defended. Indeed, the great and growing interests of citizen and government demand most absolute protection. The United States has one of its best and largest dry docks fifty miles south, a large army post at Magnolia Bluff, and at Seattle the rendezvous for coast survey vessels and revenue cutters. Besides the government properties centred about here, are the

cities of Port Townsend, Seattle, Tacoma, and the capital of the State, Olympia, all thriving, ambitious places. The golden stream from Alaska flows past our great guns, seeking security in vaults and assay offices. Many transports for Manila are despatched from these ports, and the largest battleships have tested the dry dock. Commerce with the Orient is growing fast, and will unquestionably be permanent. The climate of this part of Washington is tempered by the warm currents of the proximate ocean. The few frosts are without severity, and the snowfall light, infrequent, and of short duration. Irrigation is unnecessary; and the farms, small compared with those in the eastern part of the State, are prolific. Coal abounds in great quantities and is of fairly good quality. Large coke ovens are in successful operation. The lumber is unsurpassed, and I am told our classmate Nat Herreshoff obtained the spars of the 'Defender' from our forests. Many Eastern people are here, and capital from the older States is being invested. The Tacoma School Exhibit took first prize at the World's Fair; and a local Tannin Extract Company shows, with pardonable pride, a medal from the same source. I expect this north-west corner of the United States will ultimately be the pearl of the Union. But I am not writing a paper to induce immigration. Let me give a brief practical illustration of the value of an Institute certificate. After I had been here a short time, an increase in salary attracted the attention of some civil service clerk in Washington, who promptly held up the pay accounts of my superior, advising him the advance was unauthorized and must be discontinued. Moreover, the recipient must refund the money so illegally drawn from the public purse unless he could show a diploma as a graduate civil engineer from some school of high standing. You may be assured I lost no time in producing my sheepskin, which, doubtless, was regarded with admiration, and, I trust, with all the respect due to the signatures of John D. Runkle and Samuel Kneeland. I am happy to state the result has been quite satisfactory to myself. It does me so much good

to hear from you and to think about the old times that I believe I shall change my mind and be happy after all." — J. A. Osgood writes from Los Angeles, Cal., how hard the last two years have been on his ranch, because of the great drought.

1873.

S. E. TINKHAM, *Sec.*

City Hall, Boston.

William E. Brotherton, V., has left Burkhardt & Co., and is now associated with the firm of Rogers, Brown & Co. of Cincinnati, Ohio.

1874.

CHARLES F. READ, *Sec.*

Old State House, Boston.

Charles F. Read, the secretary of the class, has been elected clerk and treasurer of the Bostonian Society, Old State House.— H. B. Perkins, I., has been made a full professor of mathematics at the Shrook Polytechnical Institute of Pasadena, Cal. — William Foster has just made a professional visit to Boston, preparatory to a tour in Arizona.

1876.

JOHN R. FREEMAN, *Sec.*

4 Market Square, Providence, R.I.

J. H. Susmann, III., who is with Lewisohn Brothers of New York, was recently in Boston on a professional visit. — Samuel James, Jr., III., is now at the Globe Plant of the American Smelting & Refining Company in Denver, Col.

1880.

PROF. G. H. BARTON, *Rep.*

Mass. Inst. Tech., Boston.

Cass Gilbert, of Minneapolis, Minn., has been appointed the architect of the new Government Building of New York.

1881.

FRANK H. BRIGGS, *Sec.*

2 High Street, Boston.

Evelyn W. Ordway is president of the Era Club, New Orleans, president of the Women's Branch Alliance, Unitarian Church, and secretary of board of the New Orleans Free Kindergarten Association. She has delivered two addresses before the Quarante Club of New Orleans, and has

written two papers for the Chemical Society. — Webster Norris, III., has been recently appointed superintendent of the Mechanical Department of the Canadian Rubber Company of Montreal.

1882.

WALTER B. SNOW, *Sec.*

Watertown, Mass.

Henry E. Snow, manager of the Snow-Mackay Advertising Agency, is now located at 27 School Street, Boston.— Edgar B. Thompson was married June 28, 1899, to Miss Anna G. Stoker, of Watertown, S.D.— Walter B. Snow has recently lectured on "Mechanical Ventilation and Heating" at Cornell, McGill, Columbia, and Sheffield Scientific School.— Rufus F. Herrick is now located at 115 High Street, Boston, as consulting chemist for the New York and Boston Dyewood Company, with laboratories at East Boston and New York.— The class was represented at the alumni dinner by French, Herrick, Munroe, W. B. Snow, and A. W. Walker.

1883.

HARVEY S. CHASE, *Sec.*

8 Congress Street, Boston.

William B. Fuller has been for the past two years resident engineer, contracting a slow sand water-filtering plant at Albany, N.Y., which is now finished and in running order. It is a modern, up-to-date plant, the largest thing of its kind in the United States, and is probably the forerunner of many similar plants. He has recently returned from some expert work in relation to water filtration for the city of Philadelphia, Pa.— The engagement is announced of Miss Grace F. Batchelder, only daughter of Mr. and Mrs. W. O. Batchelder, and George R. Underwood, superintendent of the American Glue Company's works in this town.— Horace B. Gale was elected to the State legislature as representative from his native city, Natick, at the last election. Gale has been taking an active part in public affairs of his city for the past two years. He is secretary of the School Board and secretary of the Citizens' Committee; and, owing in great part to his activity, the com-

plexion of politics has been decidedly changed for the better in that city.— Chase has had on his hands the case of the Mayor of Haverhill, Mass. (elected on the Social Democratic ticket) *v.* the Haverhill Gas Company, which was heard in November and December before the State Commissioners. He has recently been auditing the accounts of the treasurer of Harvard College.— Two more volumes were added November 29 to the library of President Walker's works at the Technology Club; viz., "Studies in Economics," Vols. I. and II., edited by Dr. Dewey. There are now eighteen volumes, bound in the Institute colors, crimson with silver gray lettering, the gift of '83 to the club. A large photograph of President Walker now hangs above the oak bookcase, which was also a gift from the class. The case has double shelves, with green silk curtains at the sides, and a silvered plate in the centre with the words "Given by '83." Each of the books has also "'83" in silver figures in the centre of the cover.— Leonard has had two factories burned within the past few years, but now has a new one equipped with sprinklers and running full tilt on rheostats, circuit-breakers, outlet-boxes, and general and special enamel work. His method of motor control has been adopted by the navy, and played an important part in the work of the "Brooklyn's" turrets at the battle of Santiago, and is on the "Kentucky," "Kearsarge," "Alabama," "Wisconsin," and all new ships. Also used in controlling the rudder on several ships. Leonard's factory is doing about 50 per cent. export business, and he will have four hundred square feet at Paris next year. He goes abroad in January with his family, to be away about a year. Leonard was married some years ago, and has his home at 114th Street and Riverside Drive, New York, but will build in Bronxville, probably, to be near his factory and to get the advantages of this very attractive country suburb of New York. He is patentee of a steam automobile, also, which will go on the market shortly.

1884.

PROF. AUGUSTUS H. GILL, *Sec.*
Mass. Inst. Technology, Boston.

P. S. Morse, III., has accepted a position with the American Smelting & Refining Company of Leadville, Col.— C. O. Prescott, V., has gone to the Powder Point School at Duxbury, Mass., as instructor.— The secretary, in looking over a list of members of the Society of Chemical Industry resident in America, found the name of Henry D. Hooker. It looked so familiar that he ventured to communicate with him, with the result that a most cordial letter was received. He practises architecture with R. L. Dans, 26 Court Street, Brooklyn, N.Y., "and only plays at chemistry."— F. C. Williams, Jr., I., has become city engineer and county surveyor in Sheridan, Wyo.— T. W. Robinson, III., has left Pueblo to become general superintendent of the Joliet Works of the Illinois Steel Company, located at Joliet, Ill.— D. A. Lylie, III., has been promoted from captain to major, U.S.A., Ordnance Department.

1885.

A. D. LITTLE, *Sec.*
7 Exchange Place, Boston.

C. A. Brown has been elected secretary of the Boston Paper Trade Association.— I. W. Litchfield is still with the Deering Harvester Company, Chicago. He was East for two weeks this summer.— Tracy Lyon has been appointed general superintendent of the Great Western Railway.— Oakes Ames has been elected a director in the recently organized American Telephone, Telegraph, & Cable Company.— E. B. Homer has an article in the present number on his summer school abroad.— H. J. Williams is engaged upon an exhaustive study of the calorific power of coal, the results of which will be published in book form.— M. E. Recuero has resigned the treasurership of the Panama Water Works, and is now a commission merchant, his address being Apartado 91, Panama, Central America.— The present address of Josiah Pierce, Jr., is 1325 Massachusetts Avenue, Washington, D.C.— A. D. Little was elected

president of the North-eastern Section of the American Chemical Society at its October meeting.

1887.

EDWARD G. THOMAS, *Sec.*
89 State Street, Boston.

George W. Davenport has become vice-president of the Planters' Compress Company. His office is at 89 State Street. — Henry F. Stoddard is now located with the Watson Machine Company, Paterson, N.J., who are one of the most prominent makers of cordage machinery.— Gelett Burgess is in Boston for the winter.— George W. Patterson, Jr., VI., in June was the recipient of the degree of Ph.D. from Munich University.— G. A. Armington, II., has been appointed to the position of manager in the Cleveland & Crane Car Company.

1888.

W. G. SNOW, *Sec.*
4 Post-office Square, Boston.

The firm of Winslow, Wetherell & Bigelow, architects, Boston, of which H. F. Bigelow is a member, have been invitea by the Secretary of the Treasury to submit competitive designs for the new Baltimore custom-house. — The secretary would like to learn the address of Julian V. Wright.— Ambrose P. Gaines is now general manager of the Jefferson Iron Company, manufacturer of charcoal pig iron, Jefferson, Tex.— The engagement is announced of Miss Katherine Greer, of Chicago, to B. R. T. Collins.— Subscriptions to the Walker Memorial Gymnasium Fund continue to come in. Let others join.— George C. Shattuck is now of the firm of Maxwell & Shattuck, architects, Montreal.— Russell Robb is in Bombay, India, making an investigation of the tramways with reference to the introduction of electric power.— George D. Moore, who was with the class during the first year, then went to West Point, is now with the U.S.A. in the Philippines.— Frederick H. Safford, VI., has been made assistant professor of mathematics and mathematical physics at the University of Cincinnati.— R. H. Colby, V., has been elected president of the Aurora Metal Company of Illinois.—F. M. James, II., is now draughting with the General Electric Company in Lynn.

1889.

FRANK L. PIERCE, *Sec.*

31 Milk Street, Boston.

Clayton W. Pike of Keller, Pike & Co., contractors, Reading Terminal Building, Philadelphia, had charge of the installation of all the electrical apparatus in connection with the power appliances required for the Export Exposition recently held in Philadelphia.— Walter G. Wuichet is with the Pasteur Filter Company, Dayton, Ohio, as superintendent in charge of manufacturing and sales.— Paul R. Hawkins, who served through the Cuban campaign as adjutant, is now major in the Second Massachusetts Regiment. Governor Crane has appointed Major Hawkins a member of his staff.— John W. Linzee, Jr., is assistant engineer with the Boston Elevated Railway Company. — A. L. Davis, II., is assistant to the manager of the Berlin Iron & Bridge Company of East Berlin, Conn.

1890.

GEORGE L. GILMORE, *Sec.*

Lexington, Mass.

Charles W. Sherman was made the happy father of a son, born December 6. The name of the youngster is John MacDuffie Sherman, and twenty years from now will undoubtedly find him grinding at Technology.— Dr. and Mrs. W. G. Curtis are residing in Wollaston, Mass., where the doctor is practising his profession. Mrs. Curtis is a sister of H. B. Burley, also of the class of '90, and who is in the Insurance Inspection Department of the Mutual Companies.— Calvin W. Rice, electrician of the subways of the city of New York, gave a lecture, November 15, before the students of the Purdue University, Lafayette, Ind. The lecture was illustrated with over one hundred lantern views, made especially for the occasion, to show the development of high-tension electrical apparatus and service. Before the lecture Mr. Rice was tendered a dinner by the director of the Engineering Laboratory and the professors of engineering, history, botany, and agriculture.— Charles W. Sherman has recently been elected junior editor of the journal of the New England Water Works Association, and is also acting as hydraulic engineer for the city of Boston

in the case of the Boston Belting Company and the city of Boston, which is now being tried before auditors for damage caused by the taking and altering the flow of Stony Brook.— Charles F. Koch was married October 31 to Miss Jessie Achert, and they will be at home to their friends at "The Pitton," West McMillan Street, Cincinnati, Ohio.— George W. Fuller was married November 9 to Miss Caroline T. Goodloe, and will reside in Louisville, Ky., where he is engaged in business. — H. P. Spaulding, the artist, is located at the "Westland," Westland Avenue, Boston, for the winter, where he has his studio. Mr. and Mrs. Spaulding issued "at home" cards to their friends for November 23 and December 7 and 14.— E. B. Raymond became the father of a small boy a few weeks ago.— George D. Chapman is at present engaged in some important engineering work in Philadelphia for the New York Ship Building Company, where they will employ about three thousand men.— George A. Packard has been engaged this fall in Silverton, Col., but on account of severe weather has been obliged to come out, and is now at Denver. — Atherton Loring is with the Library Bureau, 530 Atlantic Avenue, Boston.—Mr. and Mrs. A. D. Boss have been in the Tim Pond region of Maine during September, enjoying the fly fishing and canoeing.— It is rumored that Billy Fenn was made the proud father of twins during the past year.— Frank M. Greenlaw, who last year was teaching in Worcester, has been appointed teacher of physics at the Lynn High School.— H. C. Slater was married September 6 to Miss Mary L. Hunt, and will reside in Milwaukee, Wis., where he is engaged in the engineering business.— Spaulding Bartlett has been appointed superintendent of the Slater Woollen Mills, Webster, Mass.

1891.

H. A. Fiske, *Sec.*

93 Water Street, Boston.

F. C. Blanchard has been engaged since last March as superintendent and mechanical engineer for American Warp Drawing Machine Company.— K. W. Mansfield has been recently promoted from superin-

tendent to vice-president and general manager of the Norwalk (Conn.) Tramway Company. He is secretary and director of the Norwalk Business Men's Association.— H. E. Hathaway, formerly chemist for the Silver Spring Bleach & Dye Works, Providence, is now with the Waldrich Bleachery, Delawanna, N. J.— P. W. England has had personal charge of the laying of underground conduits for the Bell Telephone Company at Philadelphia.— H. S. Kimball is installing a plant for the manufacture of hydrate of alumina (Bayer patents) at the Pennsylvania Salt Manufacturing Company at Natrona, Penn.— Gorham Dana recently gave an illustrated lecture on the Yosemite Valley before the Appalachian Mountain Club at Boston.— F. A. Wilson was married last June to Alice Perkins Campbell.— L. C. Wason has served as secretary of the Brookline Union (Y. M. C. A.) for the last eight years.— S. W. Wilder has recently been appointed manager for the Merrimac Chemical Company with offices at 75–77 Broad Street, Boston.— H. I. Cole, II., has left the Atlantic Iron Works to take a position as draughtsman in the department of construction and repair at the Charlestown Navy Yard.— A. W. Moseley has left William Sellers & Co. of Philadelphia to accept a position as assistant professor at the Michigan Agricultural College. He will be with Professor Charles L. Weil, of the class of '88. — Charles W. Ricker, of Buffalo, N.Y., has been appointed consulting electrical engineer of the United States Securities Company of Boston.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*
Purdue University, Lafayette, Ind.

William R. Kales is in business in Detroit. The firm name is Whitehead & Kales, contractors and engineers in steel and iron work.— James P. Buckley, who is president of the Crescent Brass & Iron Company of Detroit, served in the navy during the Spanish-American War.— Dr. Douglas A. Cater is practising medicine in Orange, N.J.— Frederick H. Meserve was married November 6, 1899, to Miss Edith

Turner, of New York. He is with Deering, Milliken & Co., dry goods commission merchants of New York.— Logan Feland, who was captain in the Third Regiment of Kentucky Volunteers, now holds a commission of lieutenant in the United States Marine Corps, and is in the Philippines.— Murray Warner is Western agent for the International Power Company, his headquarters being in the Old Colony Building, Chicago. He was an assistant engineer in the navy for six months during the Spanish War.— Charles H. Chase is a trustee of the Stoneham (Mass.) Public Library.— Severance Burrage read two papers before the Indiana Academy of Science on December 28, one on "Insects as Factors in the Spread of Bacterial Diseases," and the other (with D. B. Luten) "Preliminary Notes on the Hygienic Value of Various Street Pavements as determined by Bacteriological Analyses."— Ralph H. Sweetser, III., formerly superintendent of Everett Furnace, Everett, Pa., is now assistant to the president of the Salem Iron Company at Leetonia, Ohio.— W. S. Hutchinson, III., is at present engaged in putting in a trial plant for concentrating fine iron ore in Virginia.— John F. Vining, IV., is draughting for Allen & Vance, architects, of this city — Theodore H. Skinner is instructing in the Architectural Department at the Institute this winter, supplying the place of H. W. Gardiner, who is travelling abroad. Mr. Skinner still continues his professional work, however, as an architect in Boston, and has formed a partnership with George D. Rand, formerly of Rand & Taylor, with offices in the Tremont Building.— Albert S. Heywood was married September 28, at Atlanta, Ga., to Miss Laura C. Faute.— Albert F. Sargent was married at Malden, Mass., on September 5, to Miss Clara L. West.— George V. Wendell has returned from Germany, and resumes his duties at the M. I. T., in the Physics Department.

1893.

FREDERICK H. FAY, *Sec.*
60 City Hall, Boston.

A son arrived in the family of Fred N. Dillon of Fitch-

burg last September. Honors do not come singly to our former class president, for he has recently become a member of the Fitchburg Park Commission. — Robert N. Wallis, also of Fitchburg, has entered the field of politics. In 1899 he was a member of the Common Council of that city, to which body he has just been re-elected, and is mentioned as a candidate for the presidency of the Council for 1900.— The address of George I. King is now 46 Palmer Avenue, Detroit, Mich.— Edward McKim Hagar and Miss Martha Worthington Barry were married at the home of the bride at Mount Ida, Dorchester, Mass., December 6, 1899, by Rev. Walter E. C. Smith, rector of St. Mary's Episcopal Church of Dorchester. Only the immediate families were present, including Edmund D. Barry, M. I. T. '95, who was on from Philadelphia for the wedding. Mr. and Mrs. Hagar made a short trip to New York, Philadelphia, and Chicago, returning to Boston for the Christmas holidays. They will reside in Chicago. Beginning with the present year, Hagar becomes manager of the cement and brick department of the Illinois Steel Company, succeeding in that position Jasper Whiting, M. I. T. '89. Hagar's address is now 1041 The Rookery, Chicago, Ill.— W. A. Tucker, III., is at present in the East, recovering his health. He expects to return to the Calumet & Hecla Works about January 1.— H. W. Alden, II., is with the Pope Manufacturing Company, in the Motor Carriage Department, at Hartford.— Arthur H. Jameson, V., has accepted the position of superintendent and chemist of the Logan Manufacturing Company at Phœnixville, Pa.— C. R. Walker, V., has just returned from Idaho, where he has been investigating hydraulic gold mining.— George L. Walker, formerly master mechanic of the Department of Street Cleaning, New York City, while that department was under the charge of the eminent sanitary engineer, the late Colonel George E. Waring, Jr., is now consulting engineer with the City Wastes Disposal Company of New York. This company is organized from the staff of the late Colonel Waring for the purpose of contracting with or

giving advice to communities in the matter of the disposal of sewage, garbage, and rubbish, and the cleaning of streets. — C. A. Meade, '94, formerly superintendent of Final Disposition, New York Street Cleaning Department, is also a consulting engineer of the company.— Albert Farwell Bemis and Miss Faith Mary Gregg, daughter of Rev. and Mrs. James B. Gregg, were married at Colorado Springs, Col., December 30, 1899.— T. T. Dormin has accepted a position with Wetmore & Jennet, patent attorneys, in New York.— John W. Logan, II., has gone into the steel casting business as the head of the Logan Manufacturing Company, and is putting up a plant at Phœnixville, Pa., where steel will be made by a new process. Steel, iron, and malleable castings will be made.

1894.

W. E. PIPER, *Sec.*

Fells, Mass.

H. R. Batcheller has just finished a special research for the Mexican Mining Company. — On November 1, twelve members of the class of '94 dined together at the Technology Club, and afterward attended the theatre.

1895.

E. H. HUXLEY, *Sec.*

29 Hampshire St., Camb'port, Mass.

The secretary especially urges a prompt response to the letter just sent out regarding the subscription to the Walker Memorial Gymnasium Fund. The class is behind in its subscription, and every man must work hard to bring the sum up to the required amount.— It is with regret that I announce the death of Walter Ellis, Course I. He died October 4, of typhoid fever. He was a popular man, and his death will be felt by those who knew him best.— Azel Ames, Jr., has a good position as Supervisor of Tracks on the N. Y. C. & H. R. R.R., with headquarters at High Bridge, New York.— L. W. Ballou returned in October from a trip abroad, where he has spent the summer. — S. S. Sadtler has gone back to Philadelphia, where he has opened an office as consulting chemist.— The secretary urges all who have not already done

so to subscribe for the REVIEW. The list of subscribers from '95 is smaller than it ought to be.— R. D. Farquhar returned to Paris this fall to continue his work in architecture.— G. R. Howarth has given up his position with the Baldwin Locomotive Works, Philadelphia, and returned to Providence.— Hermann Kotzschmar, Jr., was married in November to Miss Emerson, of Wellesley, Mass.— J. L. Newell, X., has gone to Springfield, to engage in the practice of law. He has received the first prize of $375, as the college graduate of the class of '99, Boston University Law School, maintaining the highest rank during the three years' course at the Law School.— Gerard Swope has gone to St. Louis, where he will represent the Western Electric Company, with whom he has been connected since graduation.

1896.

F. E. GUPTILL, *Sec.*

71 Newbury Street, Boston.

Elbridge C. Jacobs, who at the beginning of the school year was appointed to an instructorship in chemistry at the University of Vermont, has been spending the holidays in Boston.— John L. Putnam, who is residing in Chicago, was seen in Boston recently.— A. H. Spahr, who recently received an appointment in the Treasury Department at Washington, did not relish his duties, and has again taken up architect's work in this city.— William D. Coolidge, Ph. D., who has been studying in Leipzig, Germany, since graduation, is back at the Institute again, and will tell us of some of his experiences in a talk at the class dinner, February 7.— Charles S. Newhall, who until recently has been in the employ of the Anglo-Mexican Mining Company in Sinaloa, Mexico, is still at his home in Lynn, but expects to return to Mexico very soon.— C. H. Young was one of the ushers at the wedding of Miss Mabel Kittredge and Charles Dunn, '97, in Ashmont, last November. Mr. Young returned to New York the day following the wedding.— The Tuileries, at 270 Commonwealth Avenue, is now under the management of F. M. Crosby, '96. We wish Mr. Crosby great success in his undertaking.— Both Jo-

seph H. Knight and M. E. Pierce are now full-fledged lawyers, with offices "down town." — The class dinner will be held at Hotel Brunswick on Wednesday evening, February 7. Business meeting, 6.30, and dinner following at 7.30. Music will be furnished during the courses, followed by the usual number of toasts. A large gathering is expected.— F. C. Field is of the firm of Field & Everett, electricians, 43 Cedar Street, New York.— Meyer J. Sturm, IV., paid the TECH editors a flying visit recently. — Charles S. Newhall, III., ran up to Boston last week from the City of Mexico to renew old acquaintance.— Winthrop Coolidge was married to Miss Marie Knowlton on Tuesday, January 2, in Chicago. They will be at home during March at their home 4752 Kimbark Avenue.— H. A. Pressey was married last October to Miss A. P. Fitch, of Washingtonville, N.Y.— L. K. Sager has accepted a position as assistant examiner in the Patent Office.— R. E. Bakenhus has been appointed instructor in civil engineering at Columbian University, Washington, D.C.

1897.

JOHN A. COLLINS, JR., *Sec.*

55 Jackson Street, Lawrence, Mass.

The third annual alumni class dinner of the class of '97 was held at the Technology Club on Saturday evening, December 9, 1899. Fourteen members were present. A number of the men who have always attended previous dinners have moved away from Boston, which fact accounts for the smaller number as compared with previous years. The table was laid in the dining-room, and was very prettily decorated with fruit and flowers. A full course dinner was served; and great credit is due to the culinary department of the club for the success of the same. After the dinner the speaking was wholly informal. Several matters of business were discussed at length. One of the questions concerned the advisability of holding the annual dinner each year at the club. Not a few of the men favored holding the dinner at a hotel .or outside club, where greater freedom in regard to certain matters might be had. All agreed that the dinners at

the club were first-class in every way: still, it was thought best to give the other plan a trial. It was therefore voted to hold next year's dinner at the University Club, if possible. If not there, then at some hotel to be selected by a suitable committee.— Mr. Walter Humphreys read a letter from the superintendent of the Liberty Bell Gold Mine, Telluride, Col., giving the details of the death of Thurlow Washburn. This paper is given complete in this issue. By a unanimous rising vote, it was ordered that a vote of sympathy be sent to Washburn's family. Finally, the secretary called upon each man to tell a story; and the collection was varied and amusing. The gathering broke up shortly after eleven.

"KANSAS CITY, MO., Oct. 21, 1899.

R. P. ROTHWELL, Esq., Editor *Engineering and Mining Journal*, Postal Telegraph Building, New York.

Dear Sir,— I write this letter to ask that you kindly give space in your columns to the following notice of the untimely death of Thurlow Washburn, assistant superintendent of the Liberty Bell Gold Mine of Telluride, Col. This for the benefit of his friends and in testimony of esteem. Mr. Washburn died a victim of the recent severe snow-storm in the Rocky Mountains. On Thursday morning, October 12, he started on horseback from Telluride to inspect certain work being done for the company on the high mountain range. There was a light snow falling in the valley at the time he started, but nothing serious; and, as an early visit was of considerable importance, after discussing the matter with Mr. Mercer, the superintendent, he decided to go ahead as far as he could on horseback, then turn the horse loose and proceed on foot. The horse came back about noon of the same day. The storm increased in violence, and continued until Sunday night; but no anxiety was felt, because it was supposed Mr. Washburn had reached the cabin, and was waiting there until the storm let up. On Monday Mr. Mercer was preparing to go over the range, when two of the men arrived from the camp, and reported that they had seen nothing of Mr. Washburn. Parties were immedi-

ately sent into the different basins, and search was continued uninterruptedly; but not until Wednesday was the body found, a short distance beyond the Virginius Pass. It appears that he must have been well started down from the pass toward the camp and cabin, almost within shouting distance, when a slide struck him, and threw him headforemost. He was found with about five feet of snow over him and two feet under him. Probably death came quickly, as there were no signs of his having struggled or suffered. Mr. Washburn was about thirty years of age, and was a graduate of the Massachusetts Institute of Technology, class of 1897. Previous to entering the Institute, he had spent a number of years in the West, principally in ranching in New Mexico; and he had also been occupied in railway work. Comparatively late he decided to adopt mining engineering as a profession. His first work for us was in the employ of the United States & British Columbia Mining Company in New Mexico, where he conducted an examination of certain properties in the Black Range in the autumn of 1898. From there he was transferred to Telluride, and first occupied the position of assayer of the Liberty Bell Gold Mine. In the spring of 1899 he was advanced to the position of assistant superintendent, which he filled until his death. Mr. Washburn's work for our companies was in all respects most satisfactory, and gave every promise of rapid advance in his late chosen profession. He was most thorough, conscientious, and untiring in the performance of his duties. There was no task so arduous or disagreeable that he would shrink from it; and, withal, his was a cheerful and sociable nature, that of a good companion and loyal friend. The earlier years of his life, as he quite recently related to me, had been years of strife with the obstacles and reverses of Western life, through which he had borne himself manfully and without complaint. Now that he seemed well started on the road to accomplishment and success, he was stricken down. He died as he had lived, fearlessly striving to do his duty, regardless of consequences. One can imagine him breasting the terrible bliz-

zard on those lone mountain heights, winning his way arduously up the steep slope to the pass, step by step, through the deepening snow and against the blinding, biting blast, resting in the shelter of the notch at the summit with relief that the hard task was over and the goal already in sight, starting refreshed down the slope on the home stretch. Very likely his passage through the newly fallen snow loosened its hold, and started the slide on the steep mountain side. There could have been little or no warning,— a first slight movement, followed by the rush and roar of the overwhelming mass, a hurling, stunning blow, followed by quiet and rest. Immovably held, yet softly pillowed in the great white mountain bed, he slept the sleep from which there is no awakening.

ARTHUR WINSLOW.
General Manager."

—L. L. DeMerritt is in the Monotype Department of William B. Sellers & Co., Philadelphia.— Albert P. Norris, for two years assistant chemist at the —— —— Mills, Lawrence, has given up that line of work, and has entered the Harvard Medical School.— George A. Moran, '97, has taken Mr. Norris's position.— A. C. Lamb, of the American Writing Paper Company, has been transferred from the South Lee Mills to those of the Nombrick Paper Company at Holyoke.— J. M. Gilmore has been made foreman of the transformer testing room at the Stanley Company, Pittsfield.— Harry D. Hunt, who is proprietor of the *Evening Chronicle*, North Attleboro, has recently been elected representative from the first Bristol District to the General Court of 1900.

1898.

C.-E. A. WINSLOW, *Sec.*
Hotel Oxford, Boston.

Koch is now in the foundry department of William B. Sellers & Co., Philadelphia.— E. C. Sherman is teaching in the Cambridge Evening School.— D. Q. Brown is studying at the Berlin Polytechnic Institute.— C. A. Torrey is studying for an advanced degree at Johns Hopkins.— A. A. Packard, who has been with the Herreshoffs since graduation, made most of the drawings and calculations for

the "Columbia," and overlooked her actual construction. —V. R. Lansingh, A. R. Shedd, and H. E. Sargent are with the Western Electric Company in Chicago.— Miss Forrest, besides teaching a few science classes in the Rogers Hall School, has recently delivered addresses on the African situation and on the Early Races of Europe.—C. W. Pen Dell, who is taking a post-graduate course this year, has been elected to associate membership in the American Institute of Electrical Engineers.— D. H. Blossom, who has been with the Rio Grande Western Railway Company, is now in the office of the Government Surveyor-general for the district of Utah.— E. H. Schroeder is with John Latenser, architect, Omaha, Neb., and is making a specialty of school-house construction.— C. E. Lord gave up his position as assistant in mechanical engineering to become assistant examiner at the United States Patent Office in Washington.— The following engagements are recently announced: F. C. Hastings to Miss Minnie Gates; Z. H. Long to Miss Harriet Cheshire, of Philadelphia; E. B. Paige to Miss J. W. Cruckshank; C. H. Pease to Miss Mabel H. Proctor, of Somerville; L. J. Seidensticker to Miss Rice, of Cambridge; F. H. Twombly to Miss Ethel Hasbrouck.— The following weddings have been announced to the secretary: April 24, 1899, J. F. Kelly to Miss Cecilia Hurley; June 7, 1899, F. E. Coombs to Miss Ellen L. Monson; June 23, 1899, F. B. Dawes to Miss Cida Taylor; November 14, 1899, F. B. Heathman to Miss Grace L. Brooks; December 20, 1899, R. Harris to Miss Mary C. C. Hacker; December 21, 1899, A. F. Howard to Miss Annie Fletcher.— It is rumored that F. L. Bishop, R. E. Kendall, E. R. Springer, W. F. Steffens, and H. R. Thayer are Benedicts, but particulars are not forthcoming.— Edith Pierpont Stickney, daughter of C. A. Stickney, was born January 7, 1899.— The second graduate reunion of the class of '98 was held at the Vendome, December 30, 1899. At the business meeting preceding the dinner, reports of the secretary and Dinner Committee were read. It was voted that a committee be appointed to arrange

for two or three informal meetings to be held at the club during the coming year. The desirability of issuing a class directory next year was discussed, and the plan was indorsed by vote of the meeting. The secretary was directed to pay to the Association of Class Secretaries the assessment of $40 levied by that body, and to reimburse the treasury by a class assessment next year. The meeting ended with a discussion of the Walker Memorial Gymnasium Fund,and the election of the following men to serve as a Dinner Committee for next year: F. E. Coombs, I. H. Kaufman, W. E. Putnam, Jr., A. H. Tucker, C.-E. A. Winslow. The dinner which followed was wholly informal, without toast list or set speeches, and was succeeded by a still more informal period, in which chorus singing alternated with a Virginia reel and a team race. The following men were present: J. S. Bleecker, E. S. Chapin, P. Clifford, H. T. Coburn, F. E. Coombs, R. E. Daly, F. B. Dawes, G. F. Hiller, A. H. Jacoby, I. H. Kaufman, A. S. Keen, F. M. Kendall, W. L. Learned, W. B. Nelson, C. H. Pease, C. W. Pen Dell, W. E. Putnam, Jr., J. T. Robinson, Jr., E. F. Russ, B. F. W. Russell, E. C. Sherman, W. R. Strickland, C. A. Torrey, A. H. Tucker, P. B. Wesson, C.-E. A. Winslow.— G. F. Hiller is singing at the Central Congregational Church in Newtonville, and is also an active member of the Cecilia Club of Boston.— L. D. Gardner is making a study of the subject of Colonial Administration with Professor F. J. Goodnow at Columbia, with a view to advanced degrees. — E. Kuttroff is studying chemistry in Germany at the University of Berlin.— A. L. Davis is an assistant in the Mining Department at Technology.—C.-E. A. Winslow, who has been with the State Board of Health the past summer, has returned to the Institute to fill a vacancy in the Biological Department.— A. H. Jacoby, V., assistant in the Laboratory of Industrial Chemistry, has entered the employ of F. E. Atteaux & Co., manufacturers of dyestuffs and chemicals. He is succeeded by F. E. Busby, V., '97.

1899.

W. O. ADAMS, *Sec.*

1776 Mass. Ave., Cambridge, Mass.

W. O. Sawtelle, VIII., is visiting in Boston, and called on friends at the Institute. — J. A. Fleming, VI., has been in town.— Edward H. Hammond, V., is with the Thomas A. Edison Laboratories for the Edison Portland Cement, Orange, N.J.— Last year the American Protective Tariff League offered a prize of $150 for the best essay on "The American Merchant Marine: Its Restoration by Means of Discriminative Duties." The competition was open to members of the Senior Class of all colleges in the United States; and the prize was won by Amasa A. Holden, S.B. '99. That the contest was well participated in may be inferred from the fact that, in addition to the award of the prize, honorable mention was accorded to essays submitted from Yale, the University of Pennsylvania, and six other universities and colleges.— W. R. Bean is with Newport News Ship Building & Dry Dock Company.— Stark Newell is now assistant instructor at the Institute, having left the Maryland Steel Company.— Albert F. Nathan is at present superintendent of the Industrial Zinc Mining Company at Versailles, Mo.— Clarence Moore has lately left the N.H. State Cambric Works, and has accepted a position with the American Steel & Wire Company of Worcester.— Gerald Street is studying at the State School of Mines at Golden, Col.— The first annual reunion of the class of '99 took place at the Hotel Savoy on Saturday, December 23, 1899. A short meeting was held previous to the dinner, which was served at 7 o'clock P.M. At the meeting Mr. Hammond's resignation as vice-secretary was accepted with regret. Miles S. Sherrill was elected vice-secretary. A Dinner Committee, consisting of B. E. Morse and C. M. Swan, was elected. The programme of the dinner was entirely informal, W. O. Adams acting as Toastmaster. The dinner was greatly enjoyed by all. — C. M. Lewis, III., has opened an office as mining engineer and metallurgist at Ketchum, Idaho. His thesis on the best methods of working "Crœsus" ore has proved of

great interest to miners in that vicinity, as evinced by an article in the *Weekly News-Miner*.— K. M. Blake, II., has gone to Paris in the interest of the Stanley Locomobile Company, Limited.— J. A. Patch, X., has returned to take the position of secretary of the Y. M. C. A. He will also do some advanced work at the Institute.— H. P. James, II. and VI., is with the Factory Insurance Company of Boston.— T. F. Lennan, V., is at present located in Joplin, Mo., with Mr. Nicholson, consulting engineer.— Walter O. Adams, X., is with Curtis, Davis & Co., soap-makers, Cambridge, Mass., as chemist.— Harold Ayer, V., is assistant to Dr. Whitney at the Institute.— F. W. Caldwell, II., has been with the Massachusetts Highway Commission all summer.— H. A. B. Campbell, II., is with the Dean & Main Company of Boston, and will soon do some locomotive testing for them on the Pennsylvania Railroad.—A. W. Grosvenor, II., has a very good position as heating and ventilating draughtsman in the Treasury Department at Washington, D.C.— B. S. Hinckley, II., has accepted a position in the Motive Power Department of the Northern Pacific Railway.— Amasa A. Holden, IX., is principal of a high school in West Lebanon, Me.— C. M. Lewis stopped at the Student House, Sunday, November 12, on his way to New York, from which port he sailed on Wednesday, November 15, for China. At the afternoon meeting he gave a brief outline of the work which he is to take up at the Christian College at Canton.— H. J. Skinner, V., is assistant instructor at the Institute.— Frank F. Fowle, VI., has a position as assistant electrical engineer for the American Telephone & Telegraph Company of New York City.

REVIEWS

THE LIVELY CITY O' LIGG: A CYCLE OF MODERN FAIRY TALES FOR CITY CHILDREN

By Gelett Burgess (M. I. T. '87). Published by Frederick A. Stokes Company.

In the new hemisphere of Fairyland Mr. Burgess here reaches the Furthest North; and the observations made in these rare latitudes and altitudes by a Bachelor of Science should appeal to every father interested in the education of the Technical Imagination of his offspring. The author of the "Lively City o' Ligg" has discovered a new *fauna* in Fairyland. He has laid the foundations for a new branch of Unnatural History, and he has added to literature no inconsiderable contribution of Object Lore.

Like most new ideas, however, hints of the theory so thoroughly exploited in this volume of seventeen stories have been prevalent, though comparatively unnoticed, since the earliest times; but there is little doubt that this latest addition to the bibliography of the subject was directly suggested by Jane Taylor's "Discontented Pendulum," a story familiar to the childhood of our fathers' generation. Stimulated by this fable, two great writers of modern times have devoted themselves to the study and practice of Object Lore,— Rudyard Kipling and Gelett Burgess, representing two sharply contrasted schools. In Kipling's mechanical stories, such as "The Ship that found herself" and "Number .007," we see the best examples of the realistic treatment this *motif* has received; while in the "Lively City o' Ligg" the romantic and poetic point of view has gilded the essential modernness of this practical age with a new beauty, or, at least, with a new interest. To invest commonplace things with such picturesque attributes as are portrayed by Gelett Burgess is a tremendous step forward in the scientific training of the Imagination. The dullest child cannot,

henceforth, go into the street without seeing a new world rattling about his ears. The moral trend of the book, also, will have its effect upon juvenile character; for what little child could ever be cruel to a Locomotive after reading the "Terrible Train"? What boy or girl would tease a Fire Engine or make fun of a twenty-seven-story House after hearing the fables whose lessons are so ingeniously instilled?

In his Preface for Skeptic Parents the author develops the proposition that Inanimate Objects were once endowed with will and action, with a sobriety and lucidity that bring the conclusions of his thesis before the reader as almost inevitable. His whole treatment of the subject is logical and scientific. The Cidivation of Inanimate Objects must rank henceforth, not as a theory, but a well-proven explanation of heretofore inexplicable phenomena. The discussion is based upon an analysis of: —

1. Evidences of prehistoric animation, as shown by Etymology in the gender of words in foreign languages and in English idiom.

2. Evidences of a comatose or degenerate animation in the present condition of Objects themselves.

3. Evidences of degenerate functions and features in Architecture, Mythology, etc.

Mr. Burgess's remarks upon Gender are luminous and retroactive; for he not only indubitably proves by Philology the verity of his premise as to the primeval animation of Objects, but he gives an inverse and strangely simple explanation of the philosophy of Gender itself. He says, . . . "Obviously, where there is evidence of Sex, there must have been Life, one being a function of the other." And so, finding this differentiation in point of Gender prevalent in French, Italian, and Spanish substantives, he draws the justifiable conclusion that Mills, Balloons, Houses, Boats, etc., "must have been known to be, or to have been, animate as late as the rise of the Romance Tongues."

So much we may safely admit, and, we have no doubt, will be universally accepted by Unnatural Scientists; but Mr. Burgess's next deduction is, perhaps, unconvincing, if not absolutely unwarranted. Noticing the fact that many words, such as Cannon and

Boat, for instance, are masculine in French, but feminine in German, he hazards the assertion that "Objects in their animate state had highly developed sexual distinctions, *even amongst things of the same sort.*" * This assumption we consider unjustified, and becomes inadequate when we seek the explanation of hybrids and sports. Mr. Burgess himself admits, later in the book, that both the Hand Organ and the Æolian Harp were derived from the crossing of pure windmills with Grand Pianos. Does not this prove the offspring to be not hybrid, but strictly legitimate and normal, seeing that the two parents were openly married? Again Mr. Burgess's elaborate and ingenious reconciliation of the German Neuter form with his theory falls to the ground, if we accept his statement Italicized above. He is driven to the hypothesis of three different sexes,— an awkward explanation at best, and no whit more satisfactory than the alternative possibility: that here the Neuter stands for an already extinct animation or premature cidivation.

The author has, moreover, emphasized traits particular to particular Objects with an insistence that has all the effect, if not the quality, of sex-distinction, so that his tales are likely to prove at any rate the basis of a useful and attractive Mnemonic system for those baffled by the gender of foreign languages. The terrible Train, the lovesick Piano, the high-strung, mischievous Balloon, the cruel Cannon, the vicious Hansom-cab, the odious Mill, are all virile personifications of masculinity; while as types of the Eternal Feminine we find the fickle House, changing color every night, the Locomotive that never knew her own mind, the inquisitive Church, and the vain Stable.

The second class of phenomena, including present evidences of degenerate animation, are lightly passed over with a reference to Mrs. Walker's "Total Depravity of Inanimate Things"; and doubtless every reader is familiar with her argument, based largely upon the machinations of errant collar-buttons and such small annoyances.

In his discussion of evidences of design and degenerate Thinghood in Architecture, Mr. Burgess's marshalling of facts is con-

* The Italics are Mr. Burgess's.

summate. He points out the door and window as persistence elements in all ancient Architecture, tracing their effect upon the Renaissance orders and more recent styles, and shows how those primeval organs of eating and seeing have become conventionalized and distorted by the ignorance of man. This is emphasized by a subtle criticism of the modern schools, and any architectural student may read between the lines a dignified protest against the abuse of this theory in the modern examples of what may be termed the "Anthropoid" Order of Architecture. The Preface closes with a suggestive reference to the possible intermixture of the two rival equidominant species when such missing links as the Pianolion, the Giraffopost, and the *Equus Caballustrade* may have given rise to the conception of the monstrous hybrids of Mythology.

The *mise-en-scène* of the book is the lively city of Ligg, which existed somewhere north-west of Wonderland, at that fascinating period when "animals and objects existed contemporaneously, and were equipped with approximately equal powers,"— a fitful era in the terrible struggle for supremacy which culminated in the Cidivation of Things. The human actors are but two. The myth-hero Yak, prototype of the coming race, and the Mayor o' Ligg, demigod and genius, are symbolical of the *Dingerdämmerung* that was to be. The real interest of the stories centres in the Objects whose adventures, comic, tragic, and amorous, are graphically portrayed.

The book abounds in strong character drawing, and is, as has been said, romantic in style, though several moral lessons are disguised in the masque of fable. Easily first in importance and treatment comes the story of the Terrible Train; and here the conflict between the races is cleverly as well as broadly handled, and the inevitable subjugation of the monstrous train is described with a pathos that enlists our sympathies for this unfortunate, if misguided, member of an expiring race. Contrasted with this is the idyll of the Piano in Love, an apotheosis of unrequited affection; while the exquisite comedy of the House who walked in her Sleep, and the Hilarious Hansom, will make those tales classic. The narratives, moreover, are not without dramatic quality; and

some, such as the story of Three Elevators and that of the Bothersome Brig, are distinctly actable.

The book is published in an *édition de luxe*, embellished with fifty-three drawings, eight of which are in color. The pictures are all drawn from life by the author, and are in striking contrast to the text, being literal presentments of the different characters as accurate as scale drawings. It is unfortunate that Mr. Burgess's residence in London, while the book was in preparation, compelled him to illustrate such antiquated types of machines as are found only in England; and the American youth outside of Boston, as yet untouched by Anglomania, will revolt at such puny effeminates as the Fire Engine and the little British Locomotives and Railway Carriages. He will rebel also, if we mistake not, at the diction imposed by publication of these tales serially in the *Queen*; and he will demand, in the next edition, a revision of the text and the deletion of such words as "line" for track, point for switch, "metals" for ties, and the like. The make-up is, indeed, inconsistent, seeing that the "elevator" is still unknown in England. The coloring of the plates is achieved with distinction, being rendered in the Japanese style, which diminishes the hard-and-fast realism of the line work.

NEW HIGHER ALGEBRA

By Webster Wells, S.B., Professor of Mathematics in the Massachusetts Institute of Technology. Boston, U.S.A., D. C. Heath & Co., 1899.

THE ESSENTIALS OF GEOMETRY

By Webster Wells, S.B., Professor of Mathematics in the Massachusetts Institute of Technology. Boston, U.S.A., D. C. Heath & Co., 1899.

Professor Wells begins the Preface to his "New Higher Algebra" as follows: "To meet the increased entrance requirements of many American colleges and scientific schools, the author has

prepared a work covering more ground than his 'Higher Algebra,' containing a greater number of examples, and giving more rigorous proofs of fundamental principles."

In reviewing an elementary work in mathematics, it is necessary to keep in mind that it has to serve two purposes: to give the student the fundamental knowledge which he will require in his study of the higher mathematics, and to teach him what he can do with the aid of that subject alone if he can continue his studies no farther. As both these ideas are usually emphasized on entrance examination papers, it is certainly fair to ask how well this book meets these requirements.

The translation of practical problems into "algebraic language" and their subsequent solution by algebraic processes is the main element under the second head. On this point we find very explicit and careful directions for expressing problems in algebraic form, and a large number of problems for practice,—the place where there is the least danger of the work becoming mechanical.

It is, unfortunately, a fact that the student must solve many examples, in order to fix securely the fundamental principles needed in the advanced work; but the teacher should insist upon his being able to prove the formulas and the theorems of algebra with the same accuracy that would be required in geometry. No additional time is needed, as less time may be devoted to example work, which will now become illustrative of principles rather than the mere accomplishment of a certain amount of mechanical labor. More to the credit of this book than its large number of problems is the fact that every formula and theorem is proved in such a way that the student may fairly be required to reproduce the proof in the class-room.

In the "Essentials of Plane and Solid Geometry" a larger and larger share of the work is left to the student as he goes on and increases in power. Always insisting on a reason for each statement, after a few pages the author merely refers to the article in which the reason may be found instead of stating it himself; and, still further on, he only indicates the need of a reason by an interrogation mark, and leaves the student to formulate it for himself.

It is evident that in this way the power to prove original propositions — the real aim of geometry — may be gradually and easily developed. And it is to be noted here that the book contains many originals, a large number of which have accompanying figures.

In solid geometry many students find difficulty in understanding the representation in the plane of figures of three dimensions. To meet this difficulty, Professor Wells has prepared a set of stereoscopic views to accompany the propositions. These views will undoubtedly be of value in stimulating a dull imagination, but should be used only when absolutely necessary, as one of the advantages to be derived from the study of solid geometry is the ability to make a plane representation of any geometrical solid.

Only some of the newer ideas embodied in these two text-books have been noticed, no attempt at an exhaustive review having been made.

THE FUNDAMENTAL LAWS OF ELECTROLYTIC CONDUCTION

By Dr. H. M. Goodwin, Assistant Professor of Physics, M. I. T. Harper & Brothers, 1899, New York and London.

This little volume forms one of the series of Harpers' "Scientific Memoirs," edited by J. S. Ames, Ph.D. It is not only admirable in itself, but will be of great value to those interested in electro-chemistry, who are unable to avail themselves of the original papers.

The preface of the book contains a clear statement of the subject-matter. "In the present volume are collected those papers on Electro-chemistry which contain the original statement of the fundamental laws and experiments on which the modern theory of electrolytic conduction is based."

Faraday's paper published in 1834 on the "Law of Electrochemical Action" naturally takes precedence. Following this are translations of Hittorf's memoir on "The Migration of Ions during Electrolyses," and of one by F. Kohlrausch on "The Conductivity of Electrolytes dissolved in Water in Relation to the Migration of their Components."

A short biography of the three celebrated physicists is given. Particularly interesting are the short sketches of Hittorf and Kohlrausch, who have and are still exerting such a marked influence on the physical and chemical thought of the day.

The end of the book contains a very useful bibliography of the leading papers relating to Faraday's Laws, Electro-chemical Equivalent, Transference Numbers, Velocity of Migration, and Absolute Velocities.

"With the establishment of the laws of Faraday, Hittorf, and Kohlrausch, the way was prepared for the dissociation theory of Arrhemius, which was announced in 1886, as soon as the theory of Solutions had been formulated by Vacit Hoff."

The next links in the chain of electro-chemical knowledge were formed by Pfeffer, Vacit Hoff, Arrhemius, and Raoult. They deal with osmotic pressure, dissociation, lowering of the freezing-point, all of which memoirs are to be found in the volume by Dr. H. C. Jones on "The Modern Theory of Solutions."

It is to be regretted that the Harper Series does not contain a volume on the Modern Theory of the Voltaic Cell, since such a volume would complete the series of famous memoirs on Electro-chemistry. G. V. W.

THE BIRDS OF RHODE ISLAND

By Reginald Heber Howe, Jr., and Edward Sturtevant, S.B. (M. I. T. '98). 8vo, pp. 111. 1899.

To quote from the authors' preface: "This volume on the Birds of Rhode Island, containing the first complete list of the birds of the State, is offered with the hope that it will lead to the further study of ornithology within Rhode Island, and that it will give a basis on which to build such work." It is a neatly printed, unpretentious volume, with half a dozen attractive illustrations of localities frequented by certain species. The first part of the book is devoted to a brief review of the works on Rhode Island birds,— and there are very few such publications,— a short account of the migration of birds through the State, and an entertaining

chapter on Cormorant Rock, a locality peculiarly favorable for studying the habits of some of the marine birds. The second and principal part of the book is taken up with an annotated list of two hundred and ninety species of birds which have been observed in the State. The notes on the time and place of observation seem to have been worked up with considerable care, and numerous foot-notes give references to the various publications in which the observations have been recorded. Further, three extirpated species are mentioned,— the heath hen, the wild turkey, and the passenger pigeon; and a hypothetical list of ten species gives those whose presence within the State has not been fully proven. A bibliography and two indices, one of scientific names and one of common names, completes the book, which will doubtless prove of no small value to those for whom it is intended. A. W. W.

Vol. II April, 1900 No. 2

THE TECHNOLOGY REVIEW

A QVARTERLY MAGAZINE RELATING TO THE MASSACHVSETTS INSTITVTE OF TECHNOLOGY

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The Technology Review

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THE TECHNOLOGY REVIEW is published four times a year: on the first day of January, April, July, and October. The annual subscription is one dollar; single copies, thirty-five cents each. Communications should be addressed to THE TECHNOLOGY REVIEW, 71 Newbury Street, Boston, Mass.

The Technology Review

Vol. II. APRIL, 1900 No. 2

HENRY SMITH PRITCHETT

The election of Dr. Henry S. Pritchett, Superintendent of the United States Coast and Geodetic Survey, to the Presidency of the Massachusetts Institute of Technology, was confirmed at a meeting of the Corporation held March 30. He will succeed President Crafts at the beginning of the next school year.

Dr. Pritchett was born April 16, 1857, at Fayette, Missouri, and is the son of Professor C. W. Pritchett, Director of the Morrison Astronomical Observatory at Glasgow in the same State.

His college training was obtained in the local institution in that place, and supplemented in 1876 by study in mathematics and astronomy under Professor Asaph Hall at the Naval Observatory at Washington, and later by study at the University of Munich, leading to the degree of Doctor of Philosophy.

Dr. Pritchett began his professional life as a computer in the Naval Observatory, and on competitive examination he was advanced to the place of assistant astronomer in that observatory in 1878. This place he resigned in 1880 to become astronomer at the Morrison Observatory; and in 1881 he became assistant professor of mathematics and astronomy in the Washington University, St. Louis, and continued on the faculty of that institution until 1897.

In 1882 he was appointed astronomer to the Transit of Venus expedition to New Zealand, and spent the next year in these observations and in pendulum determinations in Australia, India, China, and Japan. In 1884 he became full professor of mathematics and astronomy in Washington University, the chair formerly occupied by Professor William Chauvenet.

The greater part of Dr. Pritchett's professional life has been spent in the service of Washington University, where his work as teacher, as director of the observatory, and as president of the St. Louis Academy of Sciences, has brought him recognition among scientific men in this country and abroad. During this time he has published technical papers giving the results of original work in astronomy and geodesy, and is a member of a number of scientific bodies in Europe and America. At present he represents the United States in the international association for exact measurement of the earth, and will undoubtedly retain this position.

Dr. Pritchett has been called into the government service from time to time to take up special investigations, the results of which have appeared in various publications of the government.

In 1897 Dr. Pritchett was called by the President to the head of the Coast and Geodetic Survey, the oldest scientific department of the government. He took charge of the bureau at a time when it had been demoralized by political interference. He was called upon also to deal with the exigencies arising from the Spanish War and the large increase of coast line of the United States which resulted therefrom. The revision of the very imperfect Spanish charts of Porto Rico has been nearly completed from new surveys. His administration of the office has resulted in

a reorganization of the whole service and the adoption of a plan of work which looks years ahead, and which includes the survey of the new possessions of the United States. His administration of the office has been entirely satisfactory to the Secretary of the Treasury and to the President; and it seems likely that the permanent civil service, with promotion for merit, which is well established in the department, will prove its efficiency so completely as to commend itself to Congress and to the country. The supervision of weights and measures and of electrical standards is also in charge of the Coast Survey, and the duties are yearly demanding a closer scientific supervision.

The Coast Survey was authorized in 1807 under the direction of the Secretary of the Treasury; and work was begun in 1816, naval officers being chiefly employed. Between 1818 and 1832 the survey was directed by the War Department, and little work was done. It was put in charge of the Treasury Department in 1833, and in 1834 transferred to the Navy. In 1836 the Treasury again took control, and the survey was reorganized by a board of which Hassler was chairman. The plans then laid down have since been followed. The title was changed in 1879 to Coast and Geodetic Survey.

Men of high reputation have filled the office of superintendent, and the circumstances which have led to their retirement have been of different kinds, sometimes being due to the inevitable conflict between the man of precise methods and a system of political favoritism; but the place has always been difficult to fill apart from such causes of friction, for the duties of the office not only call for administrative and scientific ability, but also for those rare qualities in dealing with men which procure from legislative committees a recognition of the claims of a great national work of precise scientific measurement.

The list of superintendents includes Hassler, 1816–18 and 1832–43; Bache, 1843–67; Peirce, 1867–74; Patterson, 1874–81; Hilgard, 1881–85; Thorne, 1885–89; Mendenhall, 1889–94; Duffield, 1894–97; Pritchett, 1897–1900.

Professor Pritchett has published a number of papers on astronomical subjects during the last twenty years; and until recently his work, besides these researches, has been devoted to teaching mathematics, engineering, and astronomy. It is scarcely necessary to sav that the experience and high reputation gained in these fields, as well as in an important administrative position, are fitting qualities to bring to the new position as the head of the Massachusetts Institute of Technology.

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Report on Observations of the Total Eclipse of July 29, 1878. Washington, 1880.

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Eclipses of Saturn's Satellites and their Use in Determining the Planet's Diameter (with tables). Thesis for degree of Doctor of Philosophy, Munich, 1895.

Personal Equation in Time Observations. Astrophysical Journal, 1898.

Lists of Observations of Double Stars, Comets, and Small Planets in the Ast. Nachrichten, and a large number of publications in various Government Reports containing the results of Latitude, Longitude, and Gravity Determinations, Meridian Circle Observations, etc.

A Plan for an International Measurement of an Arc of the Ninety-eighth Meridian. Proc. Royal Soc. Canada, 1899.

HOUSTON HALL*

THE HOUSTON CLUB OF THE UNIVERSITY OF PENNSYLVANIA

Any visitor at the University of Pennsylvania will get an inadequate idea of that famous institution of the Quaker City if he lingers so long in the libraries and laboratories as not to see Houston Hall. If the guide is a student, he is presumably a member of the Houston Club, and will make sure that it is not omitted. If the stranger comes from another college located in a large city, he will surely envy the University this admirable provision for the social life of its students, and may leave it with another hope for the enrichment of the life of his own alma mater. The present undertaking of the Massachusetts Institute of Technology Alumni Association lends additional interest to the study of what has been accomplished at other colleges; and, while in the end the needs of the Institute will necessarily prove not quite identical with those of the University, a comparison of conditions and a careful study of the solution which has been so successful at Philadelphia cannot fail to have great value.

The University of Pennsylvania was founded in 1740, and has at present 2683 students. While located in a large city, it has been fortunate in retaining the ownership of not less than fifty-two acres of land (1897–98), with athletic grounds (Franklin Field) and dormitories. The general effect of its site and spacious detached buildings is distinctly suburban — rather than urban — in about the same degree

* Acknowledgment is due to the courtesy of the officers of the Houston Club and to Mr. Frederick M. Mann, M. I. T. '94, for highly valued aid in furnishing material for this account of Houston Hall.

as at Harvard or Yale. The need of special provision for the social and physical welfare of its students would then appear to have been much less pressing than it is at the Institute, where space can hardly be found for a tennis court or a bicycle rack, and students can only congregate in each other's way.

The foundation of Houston Hall and what it now is are told in an attractive booklet issued to members of the Houston Club, from which the following account is in substance taken: —

In one of their meetings, held some four or five years ago, a committee of the University branch of the Young Men's Christian Association was called to consider the subject of obtaining a building for the use of its rapidly increasing membership. The committee in question at this particular session numbered just thirteen, and the good luck in odd numbers which has extended down from Christopher Columbus to Rory O'More has been once more amply verified. The proposition laid before the committee was suitably ambitious: it demanded that the University branch should be housed as amply as the parent society at Chestnut and Fifteenth Streets. With this end in view, the work of securing a building fund was started, and reports of slow progress were made to subsequent committee meetings. So slow, indeed, was the progress that, after having obtained the pledges of some six thousand dollars, the hopes of the Association began to waver.

At this stage of affairs one of the trustees of the University, now its popular provost, became interested. Dr. Harrison made investigations as to the sum likely to be needed, and proposed to obtain $100,000 for this work. To realize this proposal, Dr. Harrison shortly afterward called upon Mr. H. H. Houston, the founder of the

Union Line Express Company, and afterward long identified with the activities of the Pennsylvania Railroad Company. Mr. Houston promptly responded to the call; and it was characteristic of his modesty that he never visited the building during its erection, simply issuing his checks for the money as it was needed in the progress of construction. Before the Hall was finished, the useful life of Mr. Houston came suddenly to its close. His death is too recent to have been forgotten by the community in which it was so important a factor. Dr. Harrison afterward secured from the widow of Mr. Houston a further gift of $50,000, which was required to complete and furnish the Hall.

About this time, from a spontaneous thought of the original committee, and one which was at once accepted by all who were interested in the work, the new building found its appropriate name. Some years before, Mr. Houston had sent a cherished son to the University, a son of bright promise and large preparation for the future which seemed likely to be pointed out for him. But in advance of the father this son had been called away. The Hall, therefore, came naturally to be regarded as an unconscious memorial of both parents to their child.

The plan of the structure was the result of a competitive effort among architects; and it would seem to have been happily appropriate that the prize was won by two young graduates of the University, who were in hearty sympathy with the undertaking. The location is central, and conveniently surrounded by some of the most attractive features of the campus and the tall buildings which form its border. It is designed in the style which prevailed in England at the time of the transition from the Gothic to the Renaissance. The body of the walls is of a light gray stone,

which comes from the quarry in long, flat pieces. The building has, therefore, a highly stratified appearance; and, the pointing being done in a broad, old-fashioned manner, the stone-work has the effect of great stability. The mullions, transoms, sills, door heads, copings, etc., throughout the building are of Indiana limestone, which has been used

Houston Hall.

in sufficiently liberal quantities to avoid the meagre effect which often results in American renderings of the transition, or Elizabethan, style. The broad, mullioned windows, which are characteristic of this style, have been introduced in such a way as to give the building, not only the appearance of being amply lighted, but to actually insure that result. Carved detail has been sparingly used, and is in evidence only in a few shields bearing the arms of the University and the initials of the donors at various parts of the

exterior, and also has corbels supporting the hood over the doorway, these representing Dante and Virgil. Broad terraces, paved with marble tiles and surrounded with stone balustrades, extend in front of the doorways both on the north and south sides of the building, and afford convenient meeting-places for students in fine weather.

Within the huge doors, at either entrance, is a roomy vestibule, finished with a high wainscoting of panelled oak, and surrounded with seats of the same substantial material. From inner doors one is ushered into the central reception-room. It is massively decorated in solid oak, the tables and chairs and easy seats for loungers being uniform in this respect. Wide fireplaces at either end of the room make the large space doubly inviting in cold weather by their fires of blazing logs. At the east end of this reception-room are two widely arched doorways which lead into the reading and correspondence rooms. These are crowded with ornate decorations, all well in keeping with the prevailing solidity which characterizes the entire structure. The heavy oak pillars and capitals which uphold the mantel-pieces over the broad fireplaces add to the dignity and repose of this most restful and inviting section of the building. Long lines of reading-desks, well stocked with the periodic literature of the day from various quarters of the globe, are well patronized both day and evening. There is a great abundance of the easiest of easy-chairs, in which an average man might almost hide himself from view. There are plenty of quiet nooks where the reader may become a recluse for the time being while pursuing some favorite line of study.

On the western end of the main reception hall is found the billiard, pool, and chess room, furnished with seven of the most approved modern tables for billiards and pool, with a full equipment of chess tables and a profusion of

suitable furniture. On the south front of this door are the business offices of the Club, also a hat and coat room, free for the use of members, an attendant being in charge both day and evening. In the rear of the opposite side are the news-stand, toilet and wash rooms.

Two oaken stairways, as broad and heavy as that which

Main Entrance-room.

Scrooge ascended on his memorable Christmas Eve, lead to the second floor, where the first feature to attract many is the immense fur of a grizzly bear, the head intact, the huge teeth and scarcely less murderous claws being very much in evidence. The second-floor hallway is almost as spacious as the one below. Its walls are surrounded by excellent prints and photographs from the works of famous artists. The furniture is rich and sumptuous, but never unduly prominent. At the eastern end [illegible] into the [illegible]

torium. This fine hall within a hall has space for six hundred people. Like the rest of the building, it is in the style of architecture that prevailed in England at the time of Henry VIII. and Queen Elizabeth, though, of course, a free adaptation, suited to American uses, has been made. The room is finished entirely in quartered white oak, and has a high wainscot and heavily timbered roof, somewhat similar in design to the well-known one at Eltham Palace in Kent. At the north end of the room is a proscenium arch, at the back of which a large pipe organ, with two manuals, and the bellows supplied by an electric dynamo, has been placed at a cost of $3,500. Here services are held every Wednesday afternoon during the college year, and special care is used to keep these services from becoming monotonous or perfunctory by frequently introducing different speakers to conduct them.

On the western end of this second floor the Athletic Association of the University, the Christian Association, guest chamber, and Secretary's room are clustered; and the main room in front is called the trophy room. This, to many, will be the most interesting apartment in the whole building. Here are displayed, in large, high-framed cases, the almost numberless evidences of victories "by flood and field," which have been won by classes both of earlier and more recent dates. At either end of this very large and beautiful trophy museum are handsome dining-rooms furnished suitably for the use and comfort of the various fraternities, incidental class balls, and other entertainments, for the accommodation of which these features of the Hall are in frequent demand. As an adjunct to these there is an up-to-date kitchen, supplied with all the necessary paraphernalia calculated to bring a smile to the cheek of the most accomplished chef.

The third floor is divided into numerous office, society, and committee rooms. Two of these are occupied by the University's daily and monthly journals, the *Pennsylvanian* and *Red and Blue*. There is a special room set apart for the use of the Camera Club, and in connection with it is one of the best appointed and most convenient dark-rooms

Reception-room.

for developing purposes which can easily be found in any neighborhood. There is a study-room, where, at an annual charge of twenty-five cents for a key, a student can at any time retire for purposes of special study or research. The music-room, which occupies the south-west angle of the third story, is somewhat unlike the rest of the building in architectural character. The room suggests the old inns and dwelling-houses of the Tyrol, and the heavy oak furniture carries out this idea. It is finished in pine, which

has been slightly scorched by a painter's torch before applying a transparent finish. A sombre yet interesting effect is produced in this way. A piano is here provided, and its tones can be heard almost any hour in the day reverberating along the corridors and stairways of the building. There are quite a number of society rooms here, also, which are regularly occupied by the medical, surgical, and dental societies, which hold semi-annual meetings during the season. Going from the top of the Hall to the bottom, we come, in the basement, upon a fresh array of interesting features. A gymnasium with modern appliances, a swimming-pool, a locker-room, barber shop, bowling-alley, café, which attracts numerous patrons, are among the leading attractions of this part of the building.

The art features which are scattered throughout Houston Hall really deserve a separate paper. They are numerous and valuable; and, while perhaps the selection has run too largely into one channel, there are reasons for this, which might not occur to a casual visitor. The thick walls, the dark, sombre expanse of oak panelling throughout the interior, give its two main reception halls a somewhat Rembrandtish appearance during the daytime. It is not until the many electric lights make their appearance that the real cheerfulness of these interiors becomes fully manifest. From this reason, no doubt, it has been found wise to eschew color in the varied procession of works after the great masters which are exhibited in almost every room of the building. There is a large and fine reproduction of that marvellous architectural masterpiece, the cathedral of Amiens, which first came to be known and admired by the untravelled American more than fifty years ago on the pages of Turner's "Rivers of France." Also will be seen an excellent view of the mosque of Cordova. The

list of copies of classic works by Albrecht Dürer, Raphael, Michael Angelo, Titian, Rembrandt, Rubens, Velasquez, Holbein, Donatello, and others is large and interesting. Numerous busts, copied from similar classic sources, fill salient niches in the arched doorways. In the lower recep-

Reading-room.

tion room is an oil portrait of the younger Mr. Houston, for whose memory the building holds its name, and also one of his illustrious father, through whose generosity the building was erected and equipped.

Such is a hasty description of Howard Houston Hall, mainly the result of an individual beneficence wisely directed by one who then and always has held [illegible] fortunes of the University of Pennsylvania especially [illegible] naturally a bright and attractive feature of the college [illegible] and

it may well be doubted whether any of the austerer buildings which surround it is capable of more lasting results. No one can look upon this noble structure, explore its interior, examine the features of its management, or watch the steady stream of bright and happy faces passing through it, the number of which frequently exceeds two thousand per day, without feeling that all its associations and tendencies are in keeping with the purest and best ideals of college life. In its tranquil retiring-rooms study may be wooed with new refreshment by those who may have elsewhere found its pursuit growing monotonous or toilsome. Its provisions for relaxation, for social pleasure, for active exercise, and for intellectual entertainment, are all sought to be in line with the objects of the student's life purpose, while tending to ameliorate the severity of his mental pursuits.

Houston Hall is the home of the Houston Club; that is, the Houston Club is an organization by means of which the University of Pennsylvania students enjoy their privileges in Houston Hall.

The objects of the Club are, as defined in its constitution, "to draw together students, officers, and alumni of all departments of the University in a wholesome social life, and to provide for them suitable amusements and recreations." The undergraduates themselves have control of the establishment with the following restrictions. A Board of Directors is approved and constituted by the Trustees of the University; and this Board appoints a Recording Secretary who is *ex officio* a member of all committees, and is responsible for the care of the property, with authority to order supplies, minor repairs, etc. He has authority over the employees, and receives dues and fees, accounting for the same to the Treasurer. One member of the Univer-

sity Faculty is appointed by the Board of Directors to serve on the House Committee, which makes all rules, has authority to reserve any part of the Hall for special uses, to maintain order, and to exclude any person from Hall privileges.

Membership in committees is based, to some extent, on University departments, club members voting by such departments. Any student, alumnus, or officer of the University may become a member. Active members consist of students or alumni, registered in any department of the University, who have been regularly elected upon the payment of dues. Only active members are entitled to vote or hold office, excepting in special cases.

Dues are as follows: life members, $20; active and associate resident members, $2 per year; associate non-resident members, $1 per year.

Charges are made for the use of rooms, baths, billiards, pool, bowling-alleys, etc.

The house is open during the college year on week-days from 8 A.M. to 11 P.M. and on Sundays from 2 to 7 P.M.; from June 15 to August 31, from 10 A.M. to 9 P.M. on week-days only.

Alcoholic liquors, betting, games of cards, dogs, and bicycles are excluded.

A discount list, similar to that of the M. I. T. Co-operative Society, is furnished to club members.

The Treasurer's annual report for the year ending April 1, 1899, is as follows: —

HOUSTON CLUB, UNIVERSITY OF PENNSYLVANIA

TREASURER'S ANNUAL REPORT

Cash balance April 1, 1898		$3,343.25
Receipts during Year		
Membership	$3,789.00	
Recreation	5,616.95	
News-stand	3,080.49	
Café	6,612.34	
Book-room	2,878.97	
Other sources	2,368.13	24,345.88
Total		$27,689.13
Expenditures		
Incidental expenses	$171.40	
General expenses	2,209.04	
Office	400.43	
Pool and billiards	353.66	
Bowling	95.95	
Baths	248.12	
Laundry	377.59	
Entertainments	128.94	
Reading-room	50.84	
Bell Telephone Company	109.93	
Central Light and Heat Station	2,586.21	
News-stand	2,933.98	
Café	4,733.23	
Book-room	2,495.77	
Wages	7,955.14	
Postage	136.86	
Bonds	15.00	25,002.09
Cash balance April 1, 1899		$2,687.04

SUMMARY

Cash balance		$2,687.04
Stock at news-stand	$816.70	
Stock in book-room	332.33	
Accounts due	175.38	1,324.41
		$4,011.45
Unpaid bills		1,350.11
Balance		$2,661.34

As to the question of what the Walker Memorial should be in comparison with Houston Hall, it is evident, in the first place, that the gymnasium element here must be much more emphasized and developed. Our Memorial must be a contribution to the needs of the Institute and its students, and not merely or mainly to their pleasure. It must be remembered that the coefficient of industry is relatively very high at the Institute, and the amount of leisure correspondingly small. Moreover, the Institute has no such previous provision for the physical needs of its students as the University had before Houston Hall was begun.

The question of student government, by the organization of a student club and the payment of a small membership fee which might in special cases be remitted, is an open one of much interest and importance. So, too, is the matter of offering membership, active and associate, to alumni, perhaps with some form of association with the Technology Club.

The Walker Memorial Gymnasium Committee is of opinion that the interests of undergraduates must be maintained as paramount, and that any attempt to serve those of older men at the same time should only be made after most careful study of the problem on all possible sides. The committee takes this opportunity to invite expressions of opinion on these points from the readers of the REVIEW.

H. W. TYLER, '84.

THE COURSE IN LANDSCAPE ARCHITECTURE

The development of material prosperity in the United States, followed by a wide-spread activity in erecting fine buildings and in decorating them beautifully, has once more proved the truth of Lord Bacon's statement that, "when ages grow to civility and elegancy, men come to build stately sooner than to garden finely, as if gardening were the greater perfection."

Americans have long since realized that, to have fine buildings, they must employ skilled architects, but it is only recently that they have begun to understand that landscape gardening is an art which requires as much study and training as architecture. And because men have "come to build stately," and realize the importance of "gardening finely," there is a constantly increasing demand for landscape architects.

There always has been and there probably always will be a number of able engineers, architects, and horticulturists who have drifted into the profession of landscape gardening; and there are others who will always believe that the sphere of the landscape architect is confined to beautifying roads and bridges, improving the surroundings of a building, or grouping rare plants so as to produce a pleasing effect. Actually, the field of landscape art is far broader than that, requiring a knowledge of many things and nowhere drawing a line between itself and other arts and professions. Because the landscape architect should be a civil engineer, an architect, and an expert gardener, or at least be as thoroughly grounded as is possible for one man to be in the

principles of all three professions, it is a mistake to suppose that his education can stop there. Landscape architecture requires a special training, and, not being a branch of any other art, ought not to be treated as a specialization of some other profession. But, because it has so much in common with these professions already mentioned, it can best be taught in fellowship with them; and therein lies the exceptional advantage in teaching landscape architecture where there are already well-founded courses in architecture and in civil engineering.

In Paris, where the academic system of teaching art has been worked out so carefully that France is now admitted to be the centre of the art students' world, painters, sculptors, and architects all work under the same roof; and at the École des Beaux-Arts the sculptor and painter have to take a course in architecture, and the architect and the painter have to learn to model. Surely, much of the good that comes from the French method is due to this broadening education. In the age of Pericles and at the time of the Italian Renaissance the different arts were studied side by side; and what proved wise in Greece, in Italy, and in France, will be found best in America to-day.

The new course in landscape architecture at the Institute of Technology is at present classified as an option in the architectural course; but, though classified with that department, the subjects to be studied are well distributed among several other groups. From the beginning of the second year, when the student is for the first time allowed to specialize, he is trained in drawing, in architectural design, in the principles of art in general, and in the art of landscape design in particular. Through the third and fourth years he is kept studying examples, drawing, designing, creating, analyzing results, solving problems simi-

lar to those he will meet during his professional career, working side by side with the architect, as he will be called on to do later in life, studying civil engineering, so that he may be able to design appropriately and execute his conceptions properly, and combining with all this a thorough course in the use and habits of plants.

It is fortunate that the Architectural Department of the Institute of Technology is so well organized and so successful in its results, because many artistic principles are common to both architecture and landscape gardening, and many of the practical problems to be solved are alike in both cases. Not only do the architect and the landscape gardener work out problems in much the same way, but there is the distinct advantage of a healthy competition in having the two groups of students study drawing, water-color, pen and ink, perspective, and the history of art side by side.

What is true of the Architectural Department is, in turn, true of the courses in engineering. A student must be able to survey and make topographical drawings, he must understand the principles of highway engineering and of bridge building, of estimating quantities, and of properly draining land.

But, besides all this, it is of the utmost importance that the student should realize from the very beginning that success in all his efforts must depend on a thorough knowledge of trees and plants, and, therefore, his studies at the Arnold Arboretum extend through the whole course; for he must learn the identification and the habits of trees, shrubs, and herbaceous plants, and he must also, by a long-continued study of many examples, learn their æsthetic value under varying conditions and at different seasons.

During the winter, instruction in dendrology will be

given by lectures at the Institute; while during the spring and autumn the students will work among the living plants at the Arnold Arboretum, and visits will be made to other places in the vicinity of Boston, where the best examples for studying certain branches of dendrology and horticulture can be found. In the Arnold Arboretum itself the student has a well-classified museum of trees and shrubs, where he can at all times carry on his studies; while the country places in the neighborhood of Boston and the admirable Metropolitan system of parks contains many examples of what is best in landscape art.

While the student is observing the effects that nature produces, while he is learning the constructive side in the engineering courses, while he is learning to draw and compose, he is being drilled in using his knowledge at the drawing-board. For, though the eye be well trained and the mind well stocked, the student must be able to summarize his knowledge in designing; and skill in design is the result of constant practice.

The course was laid out after consultation with the leading landscape architects of the country, and it is interesting to note that there was but little difference of opinion about the choice of subjects to be studied. Thanks to many suggestions, to many discussions, and to the kindly interest shown by many experts, the course has been so arranged that it promises to give the student a sound education in landscape architecture. The work is necessarily hard, and the years of study long; for much is required of the landscape architect to-day. And yet the student should remember that he must in every way avoid a narrow life, or a narrow point of view; for the problems to be solved are many and complex, and his noblest mission should always be to bring the love of nature nearer to the hearts of the people.

GUY LOWELL, '94.

THE COURSE IN MECHANICAL ENGINEERING AT THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY

The practical problems of the business world soon determine the value of a technical training; and, although the execution of the work depends upon a personal equation, there is a strong factor derived from a methodical system of education.

The graduate in the course of Mechanical Engineering finds a field of wide range for active work, and the lines of specialties multiplying greatly with the development of trade interests. The days when engineers were classed in two divisions only, as military and civil, are but a few years passed; yet already the Mechanical Engineer requires a qualifying title to his own degree.

With the vast amount of technical knowledge at the present time and the endless divisions and subdivisions of professional work, one soon decides that a certain path should be outlined, and that the energies should be concentrated along special lines. Not that general studies and interest should be neglected; but, like the modern machine tool, there should be a plan for utmost efficiency and greatest economy for the development along well-defined lines.

Having realized the importance of concentration, we must devise every possible means to facilitate our work, to keep pace with the exacting requirements of modern construction. Some graduates are fortunate in keeping touch with the branches of mathematics so soundly presented to us in the Mechanical Engineering Course, and so are able

promptly to apply the formulæ presented in our text-books; but, in the whirl of business contracts, the atmosphere is not conducive to agility in Calculus gymnastics; hence we integrate with a polar planimeter, and are apt to find the strength of shafting from one of William Cox's convenient slide scales. This is not a plea for any less Calculus, but a suggestion that some of the greatest helps in designing are found in these readily applied devices, and that some attention should be given to proper instruction in their various applications. It is of course acknowledged that a proper understanding of such aids is derived from a thorough study of the higher mathematics; but, so many times, prompt assistance comes from some convenient formula, expressed in few terms, which has been given us during the instruction of student days.

Such hand-books as those compiled by William Kent, for the mechanical engineer, are great helps in practical designing; and this work would be an excellent standard book of reference for every student, so used that by the end of the fourth year he should have become familiar with all the convenient tables.

In nearly every designing room, tables, curves, and diagrams become a necessity for prompt reference; and could such work be included in the course of Machine Design, and in similar studies, the student would then appreciate the value of a systematic arrangement of parts, and of the relative values of variables in the form of curves or diagrams, which have an astonishing advantage over columns or tables of figures.

Such work soon proves the saving that can be made in computations by the use of the slide scale. These instruments are made in every convenient form, and, with a little study and persistent application, become great economizers

of time. While it is true that results, read from these scales, may not be sufficiently accurate in many careful investigations, yet most problems in daily practice may be solved with sufficient accuracy. The special scales designed for strength of shafting, gearing, and belting, are great aids, if properly checked for accuracy in relation to the particular class of work in hand.

One point, which should be drilled into every student from the hour he enters his course, is system in keeping notes. If a standard size of note-book could be adopted throughout the various departments, and made of suitable paper and binding for long service, such a collection would prove a valuable addition to one's technical library, for use in after years of professional practice. The system and use of the Card Catalogue is another subject to be studied, and should be presented to the student in the first year for the practice and systematic accumulation of data.

The course of study in "Business Law" is a most important addition, and will surely receive indorsement from every graduate. In the execution of many engineering enterprises, fully as much depends upon the interpretation of contracts and relations of promoter, contractor, and engineer as in the practical execution of details. It would seem that proper forms of specification and practice in the compiling of specifications would be an excellent feature in this course. One may believe he understands all the details of a certain construction; but, when a description of its execution must be written in such terms as to be plainly interpreted by others, at once a field is found for the most careful study.

Other studies to be commended are those relating to "Industrial History and Management." Of all the departments in the great organization of modern works, that

of "Industrial Management" must receive the most profound study. Where the manner of performing certain lines of work may mean a change from loss to profit, then the importance of this particular training to the engineer who assumes the duties of a manager must be evident. One of the most necessary details in the duties of the management is the accurate determination of shop costs of operations; in detail, as well as in gross, the proper relation of expense in one department to another being shown, and a system which will promptly indicate where a disturbing element exists being devised. There are plenty of systems which may determine such costs at some distant day; but one which will produce results promptly and accurately, with proper attention to market fluctuations of crude materials, is greatly desired and worthy the attention of every engineer. The use of scale diagrams, to show the variations of labor, material, and fixed costs, becomes of great importance in connection with the determining of shop costs. Such questions are becoming so important to every engineer in charge of works that lectures from those occupying such positions would prove a great benefit to students.

In the daily practice of every graduate there are many subjects which would form excellent matter for theses; and if such could be presented to the various courses, with properly designated lines for experimental determination, the Seniors in the Theses of the Fourth Year could give some valuable information. Abstracts of Theses, containing the important determinations and suitable formulæ, diagrams, or tables of results would no doubt receive financial support from graduates in similar lines of work.

Examination of the schedules of studies in the Mechanical Engineering Course shows splendid progress and great care

displayed in the selection of subjects which will best assist the Mechanical Engineer in the practice of his profession. Many of us have occasion to pursue different paths from those which were at first contemplated, and we honor those whose careful schooling has prepared us to undertake systematic investigation of any kind. The opportunities of the Mechanical Engineer are many; and let us hope that symmetry of design, a thorough execution of details, and honest systems of administration on the part of every graduate will bear increasing testimony to the sound methods of training followed by our Alma Mater.

FRANK E. SHEPARD, '87,
President Denver Engineering Works, Denver, Col.

EDITORIALS

The Committee on Publication make no apology for the lateness of the April number, since this delay enables the REVIEW to present a portrait of President-elect Pritchett and a sketch of his career. The unanimous choice of Dr. Pritchett by the Corporation has been received with the greatest satisfaction both within and without the Institute. A man of delightful personality, of enthusiasm, of good judgment, of tact, of courage, his training as a man of science, as a professor at St. Louis, and as an administrator of one of the most important departments at Washington, has peculiarly fitted him for the high position to which he has been called. The Institute of Technology has been singularly fortunate in finding and securing such an admirable successor to the line of distinguished Presidents who have done so much to establish and extend her fame.

A recent English journal published a comparison of the gifts to education, during the last twenty years, in Great Britain and the United States. The showing is astonishingly in favor of our own country, more being given in one year here than in two decades in England. Many British schools and colleges are possessed of enormous fifteenth-century endowments, the revenues of not a few of which go to lecturers who talk to empty benches upon subjects that had lost all interest two hundred years ago. Most of these English "foundations" were given as a supposed equivalent in cash for the past sins or the future bliss of their centuries-dead givers. Spiritual torments having lost their influence as spurs to liberality, however, no other incentive seems as yet to have arisen to make the Englishman, in any degree comparable with the modern American, generous to education. Are we to infer, then, that the lavish gifts of the United States are made in penance or propitiation?

Far from it. The stupendous sums that every year are poured into schools, colleges, libraries, museums, and other institutions of education in America are, almost without exception, a free and spontaneous expression of real interest and belief in the work of education. As such, they are striking evidence of that unique combination of the practical and the ideal which makes the American millionaire a puzzle to foreigners and an uncertainty even to his countrymen.

This almost whimsical cast of mind, by reason of which the average American of wealth is intensely practical in the making of his money, but glowingly ideal in the spending of large portions of it, made the Institute of Technology possible. President Rogers was more than an idealist, he was a seer. So that, long before the college existed even on paper, he grasped the whole of what the Institute may yet become. And his wonderful personality and the faith that men had in him helped greatly to make this vision partly seen by others. Had it not been, however, for this leaven of ideality in the "practical" men of New England, the men from whom the money and the influence must come, the vision would have been far longer in reaching realization. The practical side of these early founders showed them the need of young men technically trained; but only an ideal side could have consented so unanimously to such a broad, elaborate, and complex means of filling that need as President Rogers's "Plan" proposed.

The Institute which was created by their courage and their faith has kept very remarkably a true balance between the practical and the ideal, never sacrificing knowledge to "knacks" or facts to speculation. But before its work is complete, with even human completeness, it has still far to go along the two roads of the ideal and the practical. It has now occupied the middle territory pretty completely; but the regions, on the one hand, of pure science, of extensive research, and, on the other hand, of popular usefulness,

of what it is the fashion to call "university extension," are still largely ahead of it. Not only must its teachers and students have more time for that work in pure science which, eventually, from every point of view, is the most profitable of all work, but it must build up within itself an ever-enlarging body of men, from all quarters, who use the Institute and its notable resources for no other purposes than for those of pure research. And the same combination of the practical and the ideal in Boston's merchants and manufacturers which made the Institute possible will gladly, indeed eagerly, endow these searchers, these explorers of territory yet so little known, with the money, the material, the facilities, that they will need. The intrinsic value of this future work in pure science cannot be estimated, but no less important will be its influence in uplifting and stimulating the entire atmosphere of the college.

For it will make for breadth of understanding, for completeness of view; and the key-note of all collegiate development to-day is breadth. The classical colleges are fast widening their scope into the regions of science and the useful arts; the colleges of applied science, at the same time, are broadening into the fields of pure science and the humanities. Eventually, both will meet upon a plane of work and aspiration far higher than either of them has yet attained. The classical college which does not modify the ancient curriculum to the needs of modern life is as dead as Aristotle, however gracefully the ivy of sentimental prestige may cling to its intellectual ruins. But the college of technology that does not build its foundations deep in pure science, and round out its work with a liberal allowance of the human studies of history, of literature, of social and political economy, is an educational ruin, too, with not even a spray of the ivy of tradition to cover its naked crudity, its shaking, half-finished towers, its staring windows out of which no completely educated man has ever looked. No matter what the exigency, the Corporation and Faculty of the Institute of Technology have never sacrificed in the slightest degree this essential

quality of breadth, have never lost sight of the fact that their graduates cannot be professionally successful, with an enduring success, unless they have been soundly educated in other than mere technical directions.

Had the efforts of the President and Executive Committee to secure the Franklin Fund met with the success which it merited, that other undeveloped side of the Institute's work, the spreading of its good influence among the people, might have been in great degree realized, while at the same time the real intention of Franklin would have been carried out. Perhaps even now this Fund, which seems as yet without definite destination, may be given to the Institute as a nucleus for a great Franklin Building for the encouragement and instruction of intelligent mechanics. Or, in time, funds from other sources may come to the Institute for the development, along proper, conservative, and useful lines, of this most important side of technological work.

While there never was yet a boy who did not delight to play the soldier and to inflame the neighbors, just as savages agitate their enemies, by the beating of drums and the firing of toy guns, the majority of college youth chafe under the disillusionment of semi-weekly military drill. Perhaps the democratic spirit of the collegian resents the fact that only a limited number of men can be commissioned officers; perhaps, even in the midst of wars and the rumors of more wars, he cannot see the immediate usefulness of this salutary exercise; perhaps it simply is that the youth of eighteen is constitutionally lazy. In all of these events it is clear that military drill is an excellent and much-needed tonic for the untamed Freshman, a superlative means of attaining that manly development which is one of the important ends for a college to achieve. The habit of implicit obedience is a sadly neglected one in American households, and cannot be too early remedied, since obedience of one kind or another is the main law

of life. The lifting of the chin, the squaring of the shoulders, the enforced neatness, the precision of movement, all are as good for the inner as they are for the outer man. The experience of concerted action, the sense of homogeneity, are matters almost lost sight of in the modern college, with its thousands of students, though they were and are among the chief sources of strength of the small college, with its two or three hundred youth.

Therefore, while the instruction of students for all time in the arts of war seems perhaps a large interest to pay for the small interest which the national government exhibited in the Institute by giving it only one-third of the National Land Grant, the Washington authorities seem in this case to have exhibited unwonted wisdom; for they have made easy and logical the path toward compulsory physical exercise when the time shall come to follow it. Just at this moment the educational pendulum is at the point of extreme *laissez-faire*. The student is supposed to have an intuition of what and when he ought to study; and, if this intuition fails, the college waives all obligation, the right things having been there for him to study, had he not chosen to pursue the wrong. But this phase (to which the Institute has never yielded) will pass; and it will then be seen that not only does a student's mind need guidance through the maze of human knowledge, and an ordered variety of exercise in the different modes of thought, but that his body, also, requires to be taught how to pick out the best health from all the degrees of bad and indifferent health, and that his limbs and organs need a judicious and regular variety of exercise, which only an expert is competent to prescribe and which only such compulsion as is used in the matter of his lectures and recitations is equal to enforcing.

A recent letter from Mr. Soubashew, Director of the Imperial Institute of Technology at Tomsk, Russia, shows how world-wide the reputation of the laboratories of the Institute has become. Mr. Soubashew writes: —

"Next year there is to be opened at Tomsk the Imperial Technological Institute, and shortly there will be added to it a metallurgical laboratory. The world-wide reputation which the Massachusetts Institute of Technology and its laboratory enjoy engages me to address to you the humble request to afford me some particulars concerning the Institute under your direction, as well as its laboratory, hoping that particularly the celebrated metallurgical laboratory will also serve in our country as a pattern example for such kinds of institutions. Especially desirable would be plans and a possibly exact description of the arrangement of this laboratory, as well as a statement of the work carried on there by the students."

GENERAL INSTITUTE NEWS

The first quarter of the calendar year, while not one of inactivity at the Institute, is usually uneventful. The Faculty is largely occupied in January with the laborious process of "stock taking"; that is, in attempting to determine, on the basis of many thousand C's, P's, L's, D's, and F's, what work students shall be allowed to undertake during the second half of the year. To those by whom the Institute is esteemed to be an easy place to get into, but a hard one to stay in, it may seem surprising that at the end of last term only nine students were dismissed, ten others being advised, but not required, to withdraw. These nineteen, however, represent, to some extent, "the simple who pass on and are punished," a certain number of the more prudent having preferred to withdraw voluntarily while they still had the option to do so. The second term was opened with the usual demonstrations of student aptitude for handing in revised attendance cards and rushing into the largest sections.

Professor Chandler, after suffering much in health during the first term, had been persuaded to seek relief in a journey to the Bahamas, and returned to his Institute work much refreshed.

MILITARY DRILL

Military affairs have unfortunately required more than ordinary attention on the part of the Faculty. Too large a proportion of the first-year students have failed to recognize that disorder in the lecture-room and the armory would have other and more serious consequences than the immediate unpleasantness for the instructor. The action of the Faculty in placing several students on probation has tended to create a better sense of individual responsibility on the part of the students, while the application of the class as a whole for the resumption of lectures, which

were temporarily discontinued, should strengthen that proper class spirit which may regulate the conduct of the individual student, and is at once so important and so hard to develop under Institute conditions.

LANDSCAPE ARCHITECTURE

The new option in Landscape Architecture, of which a fuller account appears on another page, has been received with adequate favor. On account of the necessarily short notification to the students, several have preferred not to register at once for the new option, but have combined the work in Horticulture, given by Mr. Lowell and Mr. Jack, with the old course IV. Inquiries have been received from several Institute graduates desiring to secure additional training for landscape work.

Mr. Lowell graduated in Architecture at the Institute in 1894, having taken his A.B. at Harvard two years earlier. On graduation he went to Paris for further study, and took his diploma at the École des Beaux-Arts last year. In accordance with the French custom, Mr. Lowell worked at the same time in the office of André, the chief authority on landscape gardening in France. He was able at the same time to follow André's course on landscape gardening at the School of Horticulture at Versailles,— a particular privilege involving his appointment as "instructor," the school not being open to foreigners. Besides travelling through a large part of Europe, Mr. Lowell spent a summer studying in Kew Gardens.

DOUBLE DEGREES

The question of simultaneous graduation in two departments has again occupied the attention of the Faculty. After much discussion it has been voted: first, that applications for graduation in two or more departments in the same year shall be granted only in cases of students who have previously anticipated fourth-year subjects, in one or both of the courses in question, to such an extent that they have ample time for the work proposed; second, that students, graduating in one or more than one course at the same time, shall

receive but one diploma, which shall, however, state the several courses in which they graduate; third, that no student shall be allowed to present two theses in the same term.

THE CORPORATION

The two hundred and eightieth meeting of the Corporation was held at the Institute, Wednesday, March 14. Reports of Departmental Visiting Committees were presented, as follows: Architecture; Mathematics; Mechanical Engineering; Naval Architecture; and Physics. Degrees were conferred on Arthur Little Hamilton in the Department of Mining Engineering and Edward Herbert in the Department of Electrical Engineering.

The two hundred and eighty-first meeting was held at the Institute, March 30. It was voted to confirm the appointment, by the Executive Committee, of Dr. Henry S. Pritchett as President of the Institute, to take effect at the beginning of the next school year.

METALLOGRAPHY

Metallography is a subject which has been receiving much attention recently at the Massachusetts Institute of Technology. The science, although established some years ago, has been developed only within the last ten years. The opportunity for the application of metallography in the iron and steel industries is very great, and the Institute of Technology is among the first to introduce a course in the subject for students of chemistry and metallurgy. The lectures on the subject are given by Mr. Albert Sauveur, a graduate of the Institute of the class of 1889, who is director of the Boston Testing Laboratories. The laboratory work is under the direction of Dr. Henry Fay. Up to the present, most of the laboratory work has been of the nature of investigation by students who have incorporated their results into graduating theses. At present an investigation is in progress the results of which will be of value to makers of boiler tubes. Samples of tubing which have been subjected to a great variety of

conditions are being studied. The examination of these specimens will show the effect that the various processes used in the manufacture of such material have on the finished article, and will indicate what treatment is harmful to the life of the tube. Another subject under investigation, which possesses a theoretical interest only, but one of importance, is the isomorphism of selenium and tellurium. The question has been attacked from the standpoint of crystallography, the best method to use in such cases, but with negative results. It is hoped that the application of the principles of metallography will decide the question definitely. Graduates of the Institute who have paid attention to metallography as students are applying their knowledge successfully in the iron and steel industry. They keep in touch with the Institute, and propose practical problems, which have come under their observation, for investigation in the laboratories of the Institute, which are amply equipped for such work.

THE INSTRUCTING STAFF

Mr. L. J. Seidensticker, formerly assistant in chemistry, has resigned, to go to Cuba as chemist for a large plantation belonging to the Soledad Estate, Cienfuegos. Mr. Seidensticker will study improved methods for the manufacture of sugar, and will devote a part of his time to the investigation of problems connected with the fertilization of a soil which produces sugar-cane.

Mr. George W. Rolfe, instructor in sugar analysis, has been granted a leave of absence for the rest of the year in order to go to Porto Rico to superintend the taking in of a crop of sugar-cane. Mr. Rolfe has had a wide experience in work of this class, and has spent much time in the study of the carbohydrates. He has been head chemist for a glucose company, has spent two years in Cuba directing the work on sugar plantations, and has carried out a number of investigations on starch, cellulose, and sugar.

Mr. Joseph W. Phelan, instructor in chemistry, will also spend the rest of the year in Porto Rico, investigating a number of problems connected with the production of sugar-cane.

Captain Zalinski, U.S.A. (retired), for a number of years Professor of Military Science at the Institute, lectured to the class of 1903 at one of their regular exercises, Saturday, March 24. Captain Zalinski has been giving a course in the Lowell Institute.

CANADIAN SOCIETY OF CIVIL ENGINEERS

The Canadian Society of Civil Engineers paid a visit to the Institute on February 1, this being one of the excursions arranged for them during their annual excursion held in Boston this year. They visited the mining, physical, and engineering laboratories, and in the latter had an opportunity to see a column tested in the large Emery testing-machine. They were also given an opportunity to see the equipment and an exhibit of the work of the department of civil engineering. The management of all of the excursions of this society, covering these days, was in the hands of Leonard Metcalf, '92, as chairman of the Excursion Committee of the Boston Society of Engineers.

BOSTON SOCIETY OF CIVIL ENGINEERS

The Boston Society of Civil Engineers held its annual meeting March 22, 1900. A paper was read by Professor C. Frank Allen, M. I. T. '72. Frank W. Hodgdon, M. I. T. '76, was elected vice-president; S. Everett Tinkham, M. I. T. '73, secretary; and Louis F. Cutter, M. I. T. '86, librarian.

THE UNDERGRADUATES

A dance was given Thursday evening, February 15, by the Architectural Society of the Institute in the studio at the top of the Architectural Building, made brilliant for the occasion by an attractive decoration of scarlet and white bunting, with numerous improvised Oriental alcoves at either side of the room. The ladies of the receiving party were Mrs. James Mason Crafts, Mrs. Francis W. Chandler, and Mrs. Desiré Despradelle.

"Tech" men are much in demand for amateur theatricals. J. S. Bleecker, the giant Queen Anne of the Cadet show, is a "Tech" man; and Allan Rowe, also a Technology student, was in the cast of "A Bit of Instruction" at the Rachel Noah benefit.

At a meeting of the Mining Engineering Society, President Clary, '00, and Vice-President Dart, '00, resigned because of their inability to devote as much time to the interests of the society as it deserved. On this account it was decided to hold the annual election of officers at that time instead of later in the year. The following officers were elected: F. D. Rash, '01, president; F. H. Sexton, '01, vice-president and treasurer; P. E. Chalifoux, '02, secretary; W. W. Garrett, '01, and C. A. Sawyer, Jr., '02, Executive Committee.

CLASS DAY OFFICERS

The Class Day officers for 1900 are as follows: —

President, Clifford Milton Leonard, of Chicago, Ill.; First Marshal, Percy Rolfe Ziegler, of Roxbury; Second Marshal, Walter L. Rapp, of Cincinnati, Ohio; Third Marshal, Marcy Leavenworth Sperry, of New York City; Historian, Herbert Milton McMaster, of Portland, Ore.; Poet, Herbert Holmes Howe, of Brookline; Orator, Charles Van Merrick, of Syracuse, N.Y.; Prophet, Frederick Hosmer Cooke, of Cincinnati, Ohio; Statistician, Newitt Jackson Neall, of Philadelphia, Penn.

CLASS DINNERS

The class of 1901 held their class dinner at the Hotel Thorndike, March 16, 1900; and it was the largest and one of the most successful class dinners that the Institute has given. Ralph Plumb acted as toastmaster, V. Frank Holmes spoke on "The Class," Herbert H. Kennedy on "Love," Ray Murray on "Athletics," James T. Scully on "Technique," and William T. Aldrich gave the class prophecy.

The annual dinner of the class of 1902 took place March 10, at Hotel Vendome, fifty-six members present. The toastmaster was Walter H. Simpson, and he was a good one. The annual address was made by Harold Otis Bosworth, I. Rayne Adams discussed "Technique," Alfred William Friend retailed a fine lot of class anecdotes, George Tilley Seabury discussed athletics in a broad and general way, Paul Ernest Chalifoux indulged in "Sparkling Generalities," and Claude Eldred Patch related experiences of his own upon the tented field during the late unpleasantness in Cuba.

There was plenty of excellent music rendered by banjo and guitar in the hands of Donald Minor Belcher, Kenneth Lockett, Arthur Harold Sawyer, Robert Louis Kruse, and Frederick Arthur Poole; while Henry Keene Hooker, a bass soloist, "like a copious river poured his song," according to the printed programme of the evening.

The front page of the menu card, which, according to one of the boys, was "a bute," was from the facile pen of A. H. Sawyer, a member of the class, and apparently represented Captain Myles Standish exhibiting a magnificent turkey, fresh from its roost on the bough of a pine-tree, and destined to grace the board at New England's first Thanksgiving dinner.

The class of 1903 made merry at Young's Hotel with songs and toasts, March 17, about seventy-five members being present. Mortimer Yale Ferris acted as toastmaster, and called on R. M. Field, G. B. Seyms, G. B. Wood, and C. J. McIntosh for responses.

ATHLETICS

The regular annual meeting for the election of officers for the Tennis Association has been held. President Badlam spoke on the condition of the association, and the secretary's report for the year was read. E. G. Thatcher, '01, who was elected president of the New England Tennis League at its formation a short time ago, told of the plans of the league in regard to a spring tournament on the Longwood courts. The election of officers for the coming year resulted as follows: president, Thatcher, '01; vice-president, du Pont, '01; secretary and treasurer, E. H. Cutter, '02; Executive Committee, Danforth, '01, Bradley, '02, Jones, '03, and the other officers.

With the approach of warm weather comes the usual revival of interest in class baseball. Following the custom of former years, the class game this spring will be contested for by the two lower classes. For the Sophomores, eight of last year's team have returned to the Institute; and, although the call for candidates has not been made, several new men have signified their intentions of trying for the team. The fact that between twenty-five and thirty men have been out regularly during the last week, trying for the Freshman team, shows that 1903 appreciates the value of early practice. The candidates are about evenly divided for the different positions; and, considering the earliness of the season, the majority are fielding and throwing exceptionally well. The practising, so far, has been done at Clover Field, as the Oval is yet too soft to play upon. The class game will, in all probability, be played at the South End grounds during the third week of May.

The relay team met Bowdoin at the B. A. A. Meet on February 3, and was beaten by a margin of 25 yards in the slow time of 3 minutes, 17⅞ seconds. Failure on the part of M. I. T. to do better work can be ascribed to lack of condition, the examination period causing a break in training which plainly affected the work of every man. Almost at the last minute Priest was compelled to give up training, and Pope was substituted.

THE GRADUATES

THE ALUMNI ASSOCIATION

The annual meeting of the Alumni Association was held at the Exchange Club, Boston, December 29, President Miller in the chair. Reports were received and accepted from the Executive Committee, Secretary, Committee on the School, Committee on the William Barton Rogers Scholarship Fund, the Advisory Council on Athletics, and the Trustees of the Alumni Fund. The membership of the Association was reported to be 2,050, 10 members having died during the year. 50 persons have become life members, and 49 associate members.

A committee of seven was appointed to consider the question of closer affiliation with the branch Alumni Associations, of which there are now eight in different parts of the country.

The Nominating Committee, in presenting its report in the form of a printed ballot, made the following additional recommendations, which were adopted: —

1. That it be made the practice hereafter for the Secretary of the Association to send out to all members of the same a list of the names of the Nominating Committee as soon as convenient after the said committee have been appointed, in order that the committee may have the benefit of any suggestions which members of the Association may desire to make bearing upon the list of names to be reported by the committee.

2. That it is the sense of the Association that hereafter the custom shall obtain of electing a new President of the Association each year, by reason of the large increase of desirable members who are now added annually to the Association, by the timely recognition of whose merits general interest may be stimulated and worthy honor distributed as frequently as possible among the many deserving of it.

The following officers were elected: president, Edwin C. Miller,

'79; vice-president, Charles T. Main, '76; member of the Executive Committee for two years, Howard C. Forbes, '91; Alumni Committee on the School for three years, John B. Blood, '90; the Committee on Associate Membership for three years, Edward A. Tucker, '95, Henry P. James, '99; members of the Advisory Council on Athletics for three years, John L. Batchelder, Jr., '90.

At the dinner following the meeting 97 members were present, together with the following guests: President Crafts, Messrs. George Wigglesworth and Desmond FitzGerald of the Corporation, Professor Gaetano Lanza, and Professor F. P. Emery of Dartmouth. Most acceptable speeches were made by the President (see January number of the REVIEW, page 30), Mr. FitzGerald, and Professor Emery. Dr. Tyler also presented a report of the Walker Memorial Gymnasium Committee (see the REVIEW for January, page 65).

NORTH-WESTERN ALUMNI ASSOCIATION

President I. W. Litchfield writes as follows in regard to the North-western Association: "The thirteenth annual banquet, held at the University Club in Chicago on Saturday, February 3, had the following programme of speeches: —

"Confessions of a Professor . . . . . Prof. W. H. NILES, M. I. T.
"Twenty-five Years without a Degree . . . . FRANK CONOVER, '76
"Liquid Air Facts and Fallacies . . Prof. GEORGE W. PATTERSON, Jr., '87
"Heart to Heart Talks with the Faculty . COLUMBIA PHONOGRAPH CO.

"It was the best and most satisfactory meeting we ever had. Over one hundred present. Professor Niles received a warm welcome, and made a good speech. Conover's effort was in rhyme. It was witty, and he made some excellent hits. We had forty gallons liquid air shipped from New York,— about twenty-five when it reached Chicago. I gave what was left to Fred Nichols, '88, who entertained the physics teachers of the city with about six gallons of it Monday P.M. Mind you, it was shipped on Thursday from New York. Professor Patterson gave an excellent

demonstration and address. We intend to have a monthly publication soon, very small, of course, and will print his paper. The University Club banquet hall is decorated with the seals of various institutions of learning. That of the Institute was surrounded by a great wreath of green, and electric lights. Mr. Clement Andrews, former Librarian of the Institute, was a guest. Following officers were elected for 1900: —

"I. W. Litchfield, '85, president; E. L. Andrews, '94, vice-president; E. M. Hagar, '93, secretary and treasurer; C. L. Burlingham, '86, L. B. Dixon, '93, and L. K. Yoder, '95, Executive Committee. The supper card was in the form of a calendar, with notice of monthly meetings at the proper dates all through the year. By the way, each man at the banquet had a finger-bowl full of liquid air to play with.

"At our monthly meeting in January, Louis Gathmann, of Washington, D.C., made an address on 'Powerful Guns.' He is the inventor of the Gathmann shell. At our March meeting the phonograph cylinders from our friends in Boston gave about thirty of us great pleasure. The interest in the air rather cut into this feature at the banquet, and only a few heard the reproduction then. The addresses were clear, distinct, and heartily appreciated and cheered.

"Next month, April 16, we have a big meeting. Professors Johnson and Fortier, of Milwaukee, will show their new method of wireless telegraphy, which differs in many respects from the Marconi system; Mr. W. A. Pinkerton will talk on some of his experiences; and Dr. Gatling, inventor of the Gatling gun, will also make an address."

THE TECHNOLOGY CLUB

Since the first of January the regular smoke talks of the Club have been continued, and have been well attended. On January 3 (as stated in the January number of the REVIEW) Professor Arlo Bates spoke on "Anglo-Saxon Natural Science." On January 19 Professor Davis R. Dewey told about the "George Junior Republic," and showed samples of its money and daily paper. On

February 9 it was planned to have Colonel Curtis Guild and Lieutenant Colonel Butler Ames, '96, give reminiscences of the Spanish War. The evening was pleasantly passed by listening to Colonel Ames, who told of the war in Porto Rico. Colonel Guild, because of an imperative engagement, was obliged to postpone his part until March 2, when he gave a most interesting account of his experiences in Cuba. Ladies were invited to listen to Mr. William Lyman Underwood's lecture, beautifully illustrated with colored lantern slides, at the eighth talk upon "The Children of the Woods." The talk of Mr. Louis F. Cutter, '86, on March 9, was illustrated by many excellent slides made by him while spending a month in Tunis and Algeria. On March 16 Gelett Burgess, '87, "Erstwhile Editor of the *Lark* and Discoverer of the Purple Cow," amused members of the Club and friends with "Some Essays in Enthusiastic Journalism." On March 30 Professor Dana P. Bartlett spoke for the Institute party which visited the Yellowstone Park last summer. Besides the delightfully colored pictures shown by the lantern, there were many taken by members of the party, besides some droll ones, which interested the members gathered to hear the talk. On this evening members of the classes of '85 to '91, inclusive, not members of the club, were invited. The class of '93 has given to the Club-house a beautiful silver punch-bowl and coffee-urn. On February 22 a picture of Mt. Vernon was received from one of the members of the club. A large photograph of ocean surf has been loaned by a member, and is hanging in the reading-room.

NEWS FROM THE CLASSES

1868.

PROF. R. H. RICHARDS, *Sec.*
Mass. Inst. Technology, Boston.

"Greene's method of analysis, given in his 'Arches,' was used in designing the two latest bridges across the Niagara Gorge, the two-hinged, spandrel-braced arch which has replaced the Grand Trunk Railway suspension bridge, and the eight hundred foot arched rib just below the Falls." The last book, published year before last, by Charles E. Greene, is "Structural Mechanics; or, The Action of Materials under Stress." It contains, among other things, a sample analysis of the stresses in a hollow cylinder, under two opposite forces, applied at the ends of a diameter; the design of the conical or the hemispherical bottom of a tank; and the determination of the stresses in a conical piston,—all of which are original. Soon after graduation from Technology, in '68, he secured a position as assistant engineer on location and construction of an eastern railroad. He was later placed in the office of the resident engineer, by whom he was given an opportunity to take part in such changes of the plan as are often made during construction. With the completion of the road he ceased his connection with it. When he was visiting in the East some twenty-seven years later, he heard that the present management of the road had made an attempt to resurvey the right of way through the city of ——, a particularly narrow and winding strip, on which it was thought that buildings were encroaching, and that such record as they found did not fit the present line. Half in jest, he suggested that he might perhaps be more successful, as he had made the original location, and had run the final centre line. He was therefore asked to make the attempt. The general manager knew of no plans, papers, or note-books; but the son of one of the original directors remembered there was a shoe-box half-full of old books and papers in a loft over

his store. He hunted up the box; and, after a few minutes' search among what the mice and mildew had spared, he found some old leather-covered note-books, which he at once recognized as the ones in which he had, long before, made so many notes and sketches in the construction of this railroad. One book proved to contain the original location and the modified line in question. But the problem was not entirely cleared up. In the development of the road and its connections the initial point of the survey had disappeared, and its surroundings were new. The gauge had been reduced, and there were differences of opinion as to which rail had been moved in the change. But in the recovered note-book he found some topographical sketches with distances locating corners of buildings and giving lengths of their sides. Some of these buildings remained in place, and could be identified; and a reversal of the distances located very closely three or four of the original station points. The record of the line itself then enabled the transit man to put it on the ground throughout the entire distance in question.— James P. Tolman, with his wife and youngest son, started in January on a trip to Italy.

1873.

SAMUEL E. TINKHAM, *Sec.*

City Hall, Boston, Mass.

R. A. Shailer called at the Institute lately, and is planning to send his son to the Institute next year.— The death of Frank Wells, for some years president of the North-western Alumni Association, has been reported.

1874.

CHARLES F. READ, *Sec.*

47 Cypress Street, Brookline, Mass.

John C. Chase is president of "The Chase-Chace Family Association," which has been organized and incorporated for the purpose of inciting interest and aiding in the compilation of a genealogical history of the family.

1875.

E. A. W. HAMMATT, *Sec.*

53 State Street, Boston.

The annual meeting of '75 was held on January 12, 1900, at Young's Hotel, at 7 P.M.,

with Vice-President Beal in the chair. The Committee on Nomination (Messrs. Aspinwall, Lincoln, and Kinnicutt) reported unanimously in favor of the re-election of the old board; and upon ballot the following were declared elected: president, Thomas Hibbard; vice-president, B. L. Beal; secretary and treasurer, E. A. W. Hammatt; Executive Committee, B. L. Beal, C. H. Williams, S. J. Mixter. There were present Messrs. Aspinwall, Atkinson, Beal, Bowers, Dorr, Hammatt, Kinnicutt, Lincoln, Mixter, Stoddard, and Williams. After the dinner, Vice-President Beal said that the occasion called attention to the fact that this was the twenty-fifth year since graduation, and especially regretted the absence of President Hibbard, due to sickness. He introduced the guests of the class; namely, President Crafts, Secretary Tyler, and Professor Sedgwick, and several hours passed in social intercourse. Professor Sedgwick paid a glowing tribute to Classmate Bowers for his work on the driven-well system of water supply for Lowell. The meeting adjourned at 11.30 P.M.— Thomas Hibbard, who was quite ill, is recovering.— W. A. Prentiss is planning to send his son to the Institute next year.

1877.

R. A. HALE, *Sec.*

Lawrence, Mass.

The annual meeting of the class was held February 13, 1900, at the Technology Club, with ten members present. Various matters were discussed,— the Walker Memorial Fund, TECHNOLOGY REVIEW, and other matters in a very informal way. Some letters were received from absent members. It was voted to send some flowers to W. E. Chamberlin, who on account of ill-health is unable to attend the meetings. An interesting letter was received from J. E. Hardman, consulting engineer, Montreal, who has made many examinations of mines in British Columbia during the past year. He is president of the Canadian Institute of Mining Engineers.— E. G. Taber is located at Spokane, Wash., engaged in railroad locations; and in various parts of the country new lines are continually being projected and

developed.— Stephen Decatur is located at Portsmouth, N.H.— W. E. Fairbanks, of Caryville, Mass., represents his district in the Massachusetts legislature this year.— C. B. Wheelock, who was with the class of '77 in the mining course for a few months, is located in Boston, on Water Street, as insurance agent. —H. H. Carter, with the Metropolitan Contracting Company, is engaged in some extensive dam construction in Nova Scotia.

1878.

LINWOOD O. TOWNE, *Sec.*
Haverhill, Mass.

The class held its annual reunion and dinner at Young's Hotel, Friday evening, December 29, President C. M. Baker occupying his usual seat at the head of the table. The class never indulges in "exercises" of late years, and the talk during and after dinner was purely informal. Besides the president the other members of the class present were W. B. Allbright, W. B. Bradford, E. P. Collier, A. S. Higgins, C. S. Rackemann, I. Rich, J. W. Rollins, Jr., J. W. Sargent, Professor P. Schwamb, E. F. Williams, L. O. Towne. — Theodore Bigelow Rollins died suddenly, January 13, from heart failure, resulting from the grip, after a week's illness. Mr. Rollins was born in Chelsea, Mass., Jan. 21, 1857, later moving to Wellesley, and there attending the public schools. He fitted for the Institute at the Allen School, West Newton, passing his examination in June, 1873, and entering the class of '77 in the fall when less than seventeen years of age. The following year he joined '78, remaining with that class two years, taking the course in architecture. He then left the Institute, working for a time in an architect's office, but soon entered the employ of his uncles, E. L. & F. S. Rollins, wall-paper jobbers, Boston. He remained with them seventeen years. At the end of that time the National Wall Paper Corporation was formed, his firm going out of business and Rollins representing (for New England) Fr. Beck & Co., a branch of the new corporation. He was well known and esteemed by men of his own business, who best knew him, and at the time of his death held one of the best positions in New

England in the wall-paper trade. His absence on business at the annual '78 class supper a fortnight before his death alone prevented his usual attendance. In February, 1896, an attack of the grip resulted in his going to Colorado for some months, to return fully recovered. Except the brief annual reunion, we of the class had little chance to know him at his best, as he grew from the boy leaving Tech. at nineteen to his full manhood. Then we knew him as the genial and companionable man of our class, always welcome. Only to those thrown with him in his maturer life can come the knowledge of what he was later to business friends and those within a closer circle. He was pre-eminently a business man, giving to that life the best of himself, working early and late. One lifelong friend writes of him, "Ever true as steel, just and sensible, conscientious and loyal,— all this and more." Another: "I had a profound admiration for his fine and splendid manhood and a great respect for all those quiet, manly ways that were characteristic of him. He represented the New England type at its best. For us all the world is poorer for his going out of it." This is the first death in our class, known to the secretary, for nearly twenty years, and but the second since graduation. Mr. Rollins was a member of Dalhousie Masonic Lodge, Newtonville. He was married in 1886. Mrs. Rollins and a boy (bearing his name) and girl are left in the Wellesley home.

1882.

WALTER B. SNOW, *Sec.*
Watertown, Mass.

The eighteenth annual dinner of the class was held at the Technology Club on the evening of February 1. The following members were present: French, Gooding, Herrick, Jenkins, H. F. Ross, W. B. Snow, A. W. Walker, and Warren.— Frederic B. Cochran, who is now located at 20 and 22 Broad Street, New York City, is a member of the New York Stock Exchange, and makes a specialty of United States government bonds.— Frederic M. Noa, who was a member of the class during its Freshman year, has been heard from at Buffalo, N.Y. He is seeking a position in the East.— Carson is a regular at-

tendant at the nearly coincident banquets of the North-western Alumni Association.— W. H. V. Rosing was promoted December 1, 1899, to the position of assistant superintendent of machinery of the Illinois Central Railroad. He previously occupied the position of mechanical engineer on the same road.— Frank C. Morrison, late of San Francisco, and Joseph H. Walker, late of Fairport, Kans., have not been heard from in response to recent communications. Any information regarding their present addresses will be appreciated.— Harry G. Manning is at present in Chicago, superintending the completion of a large new plant for the Simonds Manufacturing Company.— Charles D. Jenkins has been appointed lecturer at the Institute for the current year, on illuminating gas and pottery. — Walter H. Hersey is now treasurer of the Roubaix Worsted Mills, Providence, R.I., spinners of French system worsted yarns and worsted merino yarns for weaving and knitting.— Lloyd G. Lewis is no longer with S. N. Breed & Company, but is now connected with the Hutchinson Lumber Company of Lynn, Mass. His home address is 31 Burrill Avenue, same city.— The address of Harry M. Neff has been changed to 221 Symer Block, Denver, Col.— The home address of John P. Wood is Aernesholt, Wayne, Delaware County, Pa.— John H. Ross is abroad on business for the Boston Thread & Twine Company, of which he is president.— French, Gooding, Jenkins, Snow, W. B., and Walker, A. W., were the representatives of the class at a quiet gathering at the Technology Club on the evening of April 4.— The Cathedral of St. John the Divine, of which Heins & LaFarge are the architects, occupies a commanding position near Morningside Park, on the crest of a high bluff overlooking upper New York and the Hudson River. When completed, it will be about 520 x 296 feet, and have a spire nearly 450 feet high above the main floor and 500 feet above its lowest foundation. Both walls and tower are to be built of massive granite masonry on footings of concrete laid on rock in large pits, which were carried down to a maximum depth of 45 feet below the original sur-

face. Work has been in progress on the cathedral for about five years, but is at present being prosecuted only on the choir at the east end and on that part of the great tower which forms the west end of the choir. The crypt has been finished to form a chapel as large as many churches. It is roofed with a Guastavino arch of about 90 feet span, which is levelled up with concrete and covered with asphalt to receive the pavement of the nave. The *Engineering Record* of March 31 contains an interesting description of this work so far as it has progressed. — Howard K. Blair, who was with the class during a portion of its course, is now located in Denver, Col.

1883.

HARVEY S. CHASE, *Sec.*
8 Congress Street, Boston.

In the fall of 1886, after graduation, Frank Tenney accepted a position with the Pennsylvania Steel Company, and started in as a sort of assistant around the blast furnace department. In the fall of 1885 he was sent by the company to repair and put into operation a small furnace plant at Ashland, Baltimore County, Md., which had been leased. In the fall of 1886 he was recalled to Steelton, and appointed purchasing agent, which position he held until 1890, when he was detailed to outside work in connection with the management of the company. In 1893 he was appointed assistant superintendent of the company, in which capacity he continued to act until April, 1899, when he was appointed assistant to the president. He was married in 1889. His eldest boy is receiving the elements of knowledge which will some time make him eligible to "Tech."— George J. Foran is still doing business at the old stand, and has gone back to handling Deane & Worthington pumps as well as Blake & Knowles, and is especially engaged in cracking all kinds of pumping and compression nuts, and will be glad to hear from any man who has a conundrum in that line. He is after a good-sized contract for pumping machinery in one of our neighboring cities. If it goes on merits, he will get it.— Frank E. Davis is with the spring wire department of the American Steel &

Wire Company, where he is helping find occupation in that line for several hundred hungry proletariats, so as to keep them out of mischief. In athletics you will find a complete record of his achievements on the tenth page of the Boston *Morning Journal* of November 27, first two columns. Generally speaking, his life has flowed along rather quietly. He did not climb San Juan Hill, and has not become a hero. Nothing short of a gubernatorial job would tempt him in politics; and, financially, he is still chasing the nimble dollar, and has yet a large and varied assortment of room in his coffers.— George A. Smith is still looking after the manufacture of wall paper which, he thinks, is the finest in the country.— Gale is a "sedate Solon" at the General Court, and keeps a warning eye on members of the "Third House."— Chase has been investigating the accounts of the John P. Squire Company and allied concerns, for the "Committee of Creditors." At a meeting of the Massachusetts Society of Public Accountants, held March 6, Harvey S. Chase was elected treasurer.

1884.

Dr. AUGUSTUS H. GILL, *Sec.*

Mass. Inst. of Technology, Boston.

The class held its twentieth reunion and dinner at Young's, Wednesday, February 21. For some unexplained reason but nine members were present, which, being no quorum, no business could be transacted. Letters were read from absent members, and a very enjoyable evening passed.— Mellen is president of the Newtowne Club of Cambridge and treasurer of Lever Brothers, Limited, Boston Works, successors to Curtis, Davis & Co.— Haines has just returned from a trip to South America, in the interests of the Johnson Company.— Rich has another boy, Norman T., born October 5, 1899.— C. S. Robinson is general superintendent of the Iron and Steel Department of the Colorado Fuel & Iron Company. He and his brother attended the Washington meeting of the Mining Engineers.— F. H. Newell lectured before the Society of Arts, March 8, on "Water Storage on Gila River, Arizona."— Bunce is consulting engineer to the O. & N. Tunnel Association

and Rogers Mining Company of Ouray, Colo., in which companies he has an interest.

1885.

A. D. LITTLE, *Sec.*

7 Exchange Place, Boston.

The following notice of the work of F. H. Newell appeared in the *National Geographic Magazine* for November, 1899: "Owing to the press of his official duties as the hydrographer of the United States Geographical Survey, Mr. F. H. Newell has been compelled to resign the secretaryship of the National Geographic Society,— an office which he has so ably and zealously filled during the past two years. As an evidence of his efficient management, dating from December, 1897, it may be stated that the membership of the society has increased from 1,300 to more than 2,200, and has received an impetus that promises in the near future greatly to enlarge that number. Frederick Haynes Newell was born in Bradford, Pa., March 5, 1862. After a course at the common schools of Needham, Mass., he entered the Massachusetts Institute of Technology at Boston, where he graduated with high honors as a mining engineer in 1885. Several years were passed in miscellaneous engineering in Pennsylvania, Virginia, and various sections of the United States. In 1888 he was appointed hydrographer of the United States Geological Survey, a department then formed for the first time. Since then Mr. Newell has planned and organized the systematic measurement of the flow and capacity of many rivers in arid regions of the West, his object being to ascertain the resources of water available for the gradual reclamation of the vast tracts of desert land. In other words, a great work has been begun and is nearing completion in what Mr. Newell has aptly termed 'The Annexation of the West.' Mr. Newell is the author of 'Agriculture by Irrigation,' 'Hydrography of the United States,' 'The Public Lands of the United States,' etc."— The Cambridge *Tribune* of November 4 and the *Watchman* of October 5, 1899, contain interesting accounts of the experiences and travels of A. C. Fuller as a missionary in India. After travelling through

Japan and China, he settled in a small seacoast village in India named Kottapatam. Two years later he was transferred to Podili, a town of about 4,000 inhabitants and 40 miles inland, where he was given charge of a section of about 500 square miles, in which he was the only white man. At first he lived in tents, but later in a thatch-roofed hut; and not until eighteen months later he was enabled to complete a bungalow. In spite of serious illness and the many obstacles arising from native suspicion, Fuller brought the membership of the churches in his district up to something over 4,500. Such antagonism finally developed, however, between the converts and their Hindoo neighbors as to culminate in several riots, in one of which Fuller nearly lost his life. The ringleaders were arrested, and, after a tedious trial extending over five months, were sent to jail. In 1898, after the district had quieted down, Fuller travelled extensively through Burmah and India, going as far north as the Khyber Pass on the borders of Afghanistan. His present address is 125 Prospect Street, Cambridgeport, Mass.— Tracy Lyon, II., has been recently made general superintendent of the Chicago Great Western Railway. — Heywood Cochran is temporarily in the office of the Lorain Steel Company at Johnstown, Pa.

1886.

PROF. ARTHUR G. ROBBINS, *Sec.*

Mass. Inst. Tech., Boston.

Mr. H. B. Merriam has been abroad for some months on business for the Sims-Dudley Defence Company, with which he is connected.— Mr. William E. Shepard has left the General Electric Plant in Schenectady to become an engineer with the French Company for the Thomson-Houston System, and is now in Paris.— M. A. Vielé has opened an office in Schenectady, N.Y., as consulting civil and hydraulic engineer.

1887.

EDWARD G. THOMAS, *Sec.*

89 State Street, Boston.

The annual meeting of the class was held February 21 at Young's Hotel. Twenty mem-

bers attended. President Oren S. Hussey, of Nashua, presided at the business meeting, at which the following-named officers were elected: F. M. Wakefield, of Boston, president; H. F. Bryant, of Brookline, and E. A. Haskell, of Springfield, vice-presidents; G. O. Draper, of Hopedale, treasurer; E. G. Thomas, of Boston, secretary. — Henry J. Conant took a brief rest in March at Hot Springs, Va.— Mr. Charles A. Barton is at present with the Canadian General Electric Company in Peterboro, Canada.

1888.

W. G. Snow, *Sec.*

4 Post-office Square, Boston.

Twenty-two members attended the annual class dinner March 10 at the Technology Club. E. P. Quigley was the banner long-distance man, having come from Birmingham, Ala.— Holman, as usual, came over from New York.— George C. Scales gave a brief account of his recent trip to Porto Rico. — Runkle, who has not met with the class for a number of years, was present. He has returned to Boston, where he is connected with the National Coal Tar Company.— Incidentally, several new subscribers were obtained for the Technology Review.— Guy W. Currier, of Lawrence, is a member of the Massachusetts Senate.— C. H. Cromwell, formerly of Cromwell Brothers, brick manufacturers, Baltimore, Md., is now vice-president of the Lafayette Mill and Lumber Company of the same city.— Benj. C. Lockett, recently of the firm of Smith, Hogg & Gardner, New York, has formed a copartnership with Charles G. Taylor, of the same city, for handling fine cotton fabrics. The firm is located at 476–478 Browne Street.— The secretary would like the address of Julian V. Wright, formerly of Chicago. — F. R. Nichols has recently brought out a "Manual of Experimental Physics," published by Ginn & Co., Boston.— Mr. Richard Devens has resigned his position as engineer with a railway supply concern in Boston, to take a similar position in a manufacturing firm of London, England.— William H. Gerrish has left the U.S.A. Ordnance Department, and become the mechanical engineer of the Flax

Spinning Company at Paterson, N.J.

1889.

FRANK L. PIERCE, *Sec.*

31 Milk Street, Boston.

John Lawrence Mauran is now St. Louis partner of Shepley, Rutan & Coolidge. In the current number of *Municipal Affairs*, published by the Reform Club of New York, he very clearly states the condition of public art in St. Louis, with necessary methods for urgent improvements.— George F. Russell is superintendent in charge of the Russell Mill, operated by the International Paper Company at Lawrence, Mass.

1890.

GEORGE L. GILMORE, *Sec.*

Lexington, Mass.

The class of '90 is well represented in the Manufacturers' Contracting Company of Newark, N.J. W. H. Fenn is president, Pierre S. du Pont is vice-president, and Guy C. Emerson is the manager of the Boston branch, with an office at 170 Summer Street.— Mr. H. P. Spaulding's exhibition of water colors in New York has proved very successful, and he will soon have an exhibition in Boston.— George W. Fuller has opened an office as consulting expert in water purification and sewage disposal at 220 Broadway, New York.— A. H. Adams has gone to London to work for the Sturtevant Engineering Company there.

1891.

H. A. FISKE, *Sec.*

93 Water Street, Boston.

W. J. Roberts has been promoted from assistant professor to associate professor of mathematics and civil engineering at Pullman, Wash.— H. W. Jordan has recently left the Solvay Process Company, and is now manager of the Bowker Chemical Company's works at Elizabeth, N.J.— Frank H. Burton is chief draughtsman, Army Transport Service, Army Building, New York.— F. T. Snyder has written an article on "Metallurgic Standards," published in the "Transactions Canadian Mining Institute."— H. A. Fiske has been appointed superintendent of surveys, and placed in charge of the Underwriters'

Bureau of New England. This is an inspection bureau, making a specialty of buildings and factories protected by automatic sprinklers, the bureau being maintained by thirteen of the largest stock fire insurance companies.— The annual class dinner will be held the first or second Saturday in April, and probably at the Technology Club.— Gorham Dana spent Washington's Birthday week at Jackson, N.H., snowshoeing with the Appalachian Mountain Club. Several of the neighboring peaks were ascended, including Washington. He ascended the latter peak, with two others, by way of Tuckerman's Ravine, and had a rather perilous descent over the icy carriage road in the evening, camping at the half-way house over night.— S. Bradley is in the firm of Bradley & Chapman, installing heating and cooking apparatus.— F. H. Rose was married January 31 to Miss Mary C. Upson. The ceremony took place at the home of the bride's parents, 1612 Euclid Avenue, Cleveland, Ohio. Mr. and Mrs. Rose will be at home after April 1, 1022 Euclid Avenue.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*
Purdue University, Lafayette, Ind.

The members of '92 who attended the annual banquet of the North-western Association of the Alumni of the M. I. T. were Albert Percival Hall, George H. Lukes, Murray Warner, and Severance Burrage. '92 has always created a sensation at these banquets with its rackety-whack yell.— Murray Warner is about to sail for Shanghai, where he will remain in the employ of the American Trading Company.— Theodore H. Skinner was married on February 1 to Miss Viola C. Kelley, of Niagara Falls Centre, Ont.— Hartley Dennett was married on January 20 in King's Chapel, Boston, to Miss Mary C. Ware, of Boston.— Mr. Frank Edson Perkins, assistant professor in charge of the course in Architectural Design at the University of Pennsylvania, was in Boston during the Christmas holidays, and attended the alumni banquet. — Moses Jerome Look of Clinton, assistant engineer at the Metropolitan Water-works, and Miss Amy

Gertrude Wood of Northboro, were married at high noon, Wednesday, Jan. 10, 1900.

1893.

FREDERIC H. FAY, *Sec.*
60 City Hall, Boston.

"Electric Railway Motors," by George T. Hanchett, M.E., just published, is the latest literary effort of a '93 man. A review of the work says: This is a book unique in its treatment of electric railway equipment. The first ten chapters are devoted to minute description of the details of electric railway motors that are in use to-day. Each part of an electric railway motor is taken up in turn, described, and illustrated by examples of present and past practice, and its operation explained in the light of practical experience. In short, the review of current practice is of such a nature as to bring out the reason why the electric railway motor is built as it is to-day. For example, field magnets of different types of motors are illustrated and compared, and their features of merit and faults pointed out. Armatures, armature windings, brush holders, suspensions, and other details are similarly treated, each detail, however minute, being exhaustively considered. The last two chapters are devoted, one to the management and repair of electric railway motors, and the other to railway motor design, a complete design being worked out as an example. — An interesting letter has recently been received from Toros H. Torossian, describing his experiences in highway construction in Persia. He and his brother are associated in the work, and seem to be well equipped for dealing with the different nationalities they meet, as together they are able to speak English, French, German, Russian, Persian, Turkish, and Armenian. They employ principally the native Persians, and apparently have a strike for higher wages every few days; but this does not greatly disturb them, for, if they do not wish to grant an increase, a short reprimand will usually bring the laborers to terms. In case of serious trouble a few words to the governor will cause him to seize and sell all the donkeys and mules of the workmen, pay the contractor

his damages, and keep the remainder of the proceeds himself, — a method which would doubtless have a decided influence upon strikes in this country as well as in Persia.— On January 20 a dozen members of the class dined together at the Technology Club, and then spent the evening listening to a most enjoyable smoke-talk on Japan by Charles W. Taintor, of Manchester, N.H. The interest in the talk was heightened by the exhibition of a number of lantern slides.— Robert N. Wallis was elected president of the Common Council of the city of Fitchburg, Mass., for the year 1900, receiving sixteen out of the eighteen votes cast for that position.— Henry W. Nichols, assistant curator of geology of the Field Columbian Museum, Chicago, has received the appointment of honorary special agent of the Department of Mines and Metallurgy for the Commissioner-general of the United States to the Paris Exposition. In his latter capacity he has made the collection of lead and zinc ores for the United States Exhibit in the Exposition. Nichols has recently written articles on "The Ores of Columbia," published in the Field Columbian Museum Publications, No. 33, and on "The Marble Collections of the Field Columbian Museum," published in *Stone* for January, 1899.— S. C. Keith, Jr., recently delivered a lecture on bacteria in milk before the Association of Boards of Health of Massachusetts. For several years Keith has held an appointment as lecturer on biological subjects at the Institute, and this year he delivers a course of lectures there on the bacteriology of milk products.— From Mr. and Mrs. Heiichiro Maki, of Tokyo, Japan, is received the announcement of the birth of their daughter, Sidzuko, on June 26, 1899.— Jonathan E. Woodbridge, editor of the *American Electrician*, New York City, was married July 25, 1899, to Miss Ethel M. Hotchkiss.— Frederic P. Simonds is a member of the firm of Stratton & Simonds, architects, 52 Kilby Street, Boston.— George L. Walker recently delivered a course of lectures on sanitation at the Teachers' College, Columbia University, New York City.— Florence Marion Laighton, M.D., who took special work with the class and later

graduated elsewhere in medicine, was physician at the New England Hospital for Women and Children, Boston, in 1898 and 1899, and is now a member of the Vanderbilt Clinic, as well as engaged in general practice in New York City.— James A. Emery, of the firm of Emery & Crump, street railway engineers, is at present in charge of the construction of the Atlanta Rapid Transit Lines, Atlanta, Ga.— Walter I. Swanton has resigned his position as bridge inspector of the Boston & Albany Railroad to enter the employ of the Union Bridge Company at Athens, Pa., as draughtsman.— John Ormsbee Ames, of Providence, R.I., served during 1898 and 1899 as first lieutenant, commanding Company A, First Regiment Infantry, Rhode Island militia. The following are some of the other organizations of which Ames is a member: Hope Club, Agawam Hunt Club, Rhode Island Society of Cincinnati, and the Delta Psi Fraternity.— Harry M. Latham has recently associated himself with the engineering department of the American Steel and Wire Company at Worcester, Mass.

1894.

W. E. PIPER, *Sec.*

Fells, Mass.

B. S. Harrison has opened an office for himself as architect at Lacrosse, Wis.— J. Calvin Locke was married to Miss Lillian Green on November 22, 1899, at Brooklyn, N.Y.

1895.

E. H. HUXLEY, *Sec.*

29 Hampshire St., Camb'port, Mass.

John Dyer, Jr., is in the firm of Denniston & Dyer, building and contracting business. The firm is engaged at present on government buildings at army posts.— Azel Ames, Jr., announced his engagement recently.— A. D. Fuller sailed for Europe in January, where he goes as engineer in charge of the Massachusetts State Exhibit at the Paris Exposition.— The secretary urges a prompt response to his notice of assessment. The Association of Class Secretaries has levied an assessment on all the classes, which renders further funds necessary.— A plan has been suggested for the Boston mem-

bers of the class to meet informally at dinner, and to have the representatives in the different cities to meet on the same night, and possibly have a short telephone conversation between the various organizations. If any support is given to the scheme, it may be successfully tried.— Clifford B. Sanborn has opened a law office in the Niles Building, Boston.— Luther Conant, Jr., is now editor of "Outside Securities," *Journal of Commerce and Commercial Bulletin*, Nos. 17 and 19 Beaver Street, New York, N.Y.

1896.

F. E. GUPTILL, *Sec.*

71 Newbury Street, Boston.

William H. McAlpine has been appointed hydrographer in the United States Navy on United States steamship "Ranger," connected with the Mare Island Navy Yard.— On Wednesday evening, January 24, 1900, at the First Church of Christ, Springfield, Mass., Alice Billings Mayo was married to Harry George Fisk. Mr. and Mrs. Fisk will reside at 367 Union Street, Springfield.— G. C. Hall, who until recently has been with the Electric Railway Company of Chicago, has returned to Boston, and is with Stone & Webster, electrical engineers, 4 Post-office Square.— William H. Clifford, of Portland, Me., who is a first lieutenant in the United States Marine Corps, is in the Philippine Islands, where he will probably remain for another year.— George E. Merryweather sailed about the middle of February for Paris, where he is to represent the Browne & Sharpe Manufacturing Company of Providence at the Exposition.— Lambert N. Whitney was in Boston in February from New York.— H. F. Hawley, formerly at 11 Mt. Vernon Street, is now in Baldwinsville, N.Y.— There were twenty-three members present at the class dinner held on the 16th of February at Hotel Brunswick. Rockwell presided. Toasts were responded to by Smalley, Tyler, Knight, and Ames; and each member contributed a few words as he was called on by the toastmaster. Music, etc., were on tap during the evening; and everybody appeared to enjoy himself.— R. F. Portner died January 23, 1900.

1897.

JOHN A. COLLINS, JR., *Sec.*
55 Jackson Street, Lawrence, Mass.

E. P. Mason has been transferred from the experimental department of Draper Company to the position of travelling salesman.— Elmer L. Gerber is acting as instructor in architectural drawing at the Y. M. C. A. in Dayton, Ohio.— Frank H. Keisker has become a member of the T-Square Club of Philadelphia.— Charles L. W. Pettee, formerly with the Pope Manufacturing Company of Hartford, is now associated with Henry Souther, '87, in doing metallurgical work.— Irenée du Pont is treasurer of the Manufacturers' Contracting Company of Newark, N.J. He was married on Thursday, February 1, to Miss Irene du Pont, of Wilmington, Del.— Proctor L. Dougherty, who has recently gone into the office of the Supervising Architect, Washington, D.C., read a paper a short time since before the Washington Architectural Club on "Decorative Illuminations." — William K. Fairbanks acted as representative of the Clinton Wire Cloth Company at the National Export Exposition, Philadelphia.— Ralph A. Bowen was married on August 9, 1899, to Miss Dorice Eugénie L'Hommedieu. Mr. Bowen is manager of the New York office of Charles S. Norton, importer of aniline colors and dyestuffs.— Otto S. Pike, II., was married on October 3 to Miss Millie T. Killam, of Malden. He is at present connected with the Boston Pneumatic Transit Company.— Frank W. Everett, VI., has left the Union Iron Works to establish the firm of Field & Everett, engineers, with offices in New York City.— Oswald C. Hering, IV., with his fiancée, Miss Anna Linderfeldt of Paris, visited Boston recently. He will do architectural work in New York this winter.— E. C. Jacobs, III., has just received and accepted a call from the University of Vermont to fill a place as instructor of chemistry, mineralogy, and assaying.— F. L. Edmands has accepted a position as assistant examiner in the Patent Office. — W. O. Sawtelle is teaching mathematics and physics in the Bangor High School.— Mr. Walter B. Russell, assistant in mechanical engineering, was re-

cently associated with R. S. Hale, of Boston, in preparing a paper read before the American Society of Mechanical Engineers. The title of the paper was "Boilers and Furnace Efficiency."— E. B. McCormick was married on December 26 to Miss Jeanette Maxey, of Bozeman, Mont. Mr. McCormick is teaching engineering in the Montana State College.— A. H. Nelson has been made a director of the Pittsburg Bridge Company.— The engagement is announced of John A. Collins, Jr., to Miss Mabel C. Fisher, of Newtonville, Mass.

1898.

CHAS.-E. A. WINSLOW, *Sec.*
Hotel Oxford, Boston.

Frank B. Heathman, of Dayton, Ohio, was married on Tuesday, November 14, to Miss Grace L. Brooks (Smith, '97), of Roxbury. Mr. Rudolph Tietig, of Cincinnati, was the groom's best man. — There is a colony of '98 architects in Paris this winter, including H. P. Richmond, G. P. Stevens (who holds the Swett Fellowship), J. H. House, and H. C. Ingalls.— W. D. Hubbard has a permanent position as superintendent of the new Concord Sewerage System, upon the construction of which he and W. B. Wood have been engaged. It is rumored that Hubbard is to be married in the fall.— W. E. Putnam, Jr., has opened an office as practising architect at 1 Somerset Street, Boston. He is at present engaged with designs for extensive alterations in an office on the corner of Somerset Street and Beacon.— L. D. Peavey has returned from New York to take a position with the New England Structural Company of Everett, Mass.— W. L. Butcher is now in the Engineering Department of the Massachusetts State Board of Health.— B. A. Adams has been appointed superintendent of manual training at Talladega College, Talladega, Ala. — C. J. Skinner, who was engaged during the summer of '99 on the construction of the Blackwell Branch of the Atchison, Topeka & Santa Fé Railroad in Oklahoma, has been suffering from a severe attack of typhoid fever, from which he has but recently recovered.— C. Le Moyne is at Idaho City,

Idaho, with the Boston and Idaho Gold Dredging Company, working with a new method of mining placer gold.— J. S. Bleecker made a great hit as Queen Anne of Austria in the 1900 Cadet play, "Miladi and the Musketeer."— E. M. Taylor has been recently engaged in putting a 15-inch coast defence dynamite gun battery in place at Fisher's Island, N.Y.— R. E. Wilder has been advanced in rank as a draughtsman engaged on mill building construction with the Cambria Steel Company at Johnstown, Pa.— E. R. Butterworth announces his engagement to Miss Mary Baldwin Reed, of Somerville, Mass.— D. L. Wing has relinquished the lumber business to take a position in the Census Bureau at Washington, D.C.— F. A. Jones is practising as a civil engineer at Kenyon, Minn.— G. B. Pillsbury will graduate from West Point in June.— T. E. Tallmadge and R. S. De Golyer are both with D. H. Burnham & Co., architects, of Chicago. Tallmadge's old friends who have not heard a word from him since graduation may be glad to know that he is said to be doing well.— G. F. Ulmer has been promoted from the position of assistant chemist to that of chemist, with the Arbuckle Sugar Refining Company. He is arranging to have an informal reunion of the '98 men in New York during the spring.— P. H. Lombard left the Bell Telephone Company of Philadelphia last fall to take a position with the General Electric Company of Schenectady.— R. E. Kendall was married on October 4, 1899, to Miss Henrietta Frame Shattuck, of Hyde Park, Mass.— G. R. Davison is a member of the Peabody Board of Trade.— A. F. Howard is with the Portsmouth (N.H.) Electric Railway as electrical engineer on construction and assistant superintendent in the operation of the road.— F. E. Coombs has given up professional work in architecture, and is now interested in building materials, especially various burned clay products.— W. White is with a powder manufacturing company at South Amboy, N.J.— W. L. Learned is with the Metropolitan Sewerage Commission at 1 Mt. Vernon Street, Boston.— '98 men in the neighborhood of Boston held a pleasant informal

reunion at the Technology Club on the evening of March 27.

1899.

WALTER O. ADAMS, *Sec.*

1776 Mass. Ave., N. Cam., Mass.

Arthur Hamilton has lately gone to Montana to take the position of chemist with the Boston & Montana Smelting & Refining Company at Great Falls.— Ted Hammond has left the Edison Laboratory to accept a position with W. F. Jobbins at Aurora, Ill.— In the recent Cadet play, "Miladi and the Musketeer," '99 had three representatives, Frederic B. Stearns, "Tim" Hoxie, and Walter Adams. Tim made a corking girl.— A committee has been appointed by the secretary to engineer the collection of subscriptions from '99 for the Walker Memorial Fund. Over two hundred dollars has already been subscribed, and good progress is daily being made.— Monthly dinners are being held by the fellows living in or near Boston. They are very informal, beginning about six and ending in time for the theatre. The men come in directly from business, without the preliminary fussiness generally attending more pretentious affairs. The secretary will be glad to furnish particulars to any one not already having received notice.— Percy W. Witherell is with Warren F. Witherell, grocer, Boston, Mass.— B. P. Hazeltine is working in the draughting-room of the National Tube Works at McKeesport, Pa.— A. F. Nathan is working for the American Mining Company at Joplin, Mo.— W. Malcolm Corse is with W. S. Merrell Chemical Company, Cincinnati, Ohio.— Charles Barnard Page is in the shop of the Maryland Steel Company at Sparrows Point, marking out work for all the machine tools. He is now getting out the machinery and structural parts for four new U.S. torpedo-boat destroyers.

REVIEWS

THE TECHNOLOGY QUARTERLY

The thirteenth volume of the TECHNOLOGY QUARTERLY commences with the issue for March. This number contains "Proceedings of the Society of Arts, October to December, 1899"; "New Cellulose Industries," by Mr. A. D. Little; "Character and Extent of Food and Drug Adulteration in Massachusetts and the System of Inspection of the State Board of Health," by Mr. Albert E. Leach; "The Temperatures at which Certain Ferrous and Calcic Silicates are formed in Fusion and the Effect upon these Temperatures of the Presence of Certain Metallic Oxides," by Professor H. O. Hofman; "Review of American Chemical Research."

OUTLINES OF INDUSTRIAL CHEMISTRY

BY FRANK HALL THORP, Ph.D. (M. I. T. '89), Instructor in Industrial Chemistry in the Massachusetts Institute of Technology. New edition, revised. 541 pp. New York, the Macmillan Company, 1899.

It is gratifying to note that a second edition of this text-book is already called for, indicating that the results of the labor involved in this compilation of material have been appreciated by teachers and students of industrial chemistry. The changes made in the present edition are in the nature of corrections, or modifications of details, and do not alter its general character. A new diagram indicating the successive processes which go on in a sulphuric acid chamber has been introduced; a description of the Herreshoff pyrite burner replaces that of one of the older forms; the cell used in the Le Sueur process is now described, the data not being previously available; some changes have been made in the discussion of fats, oils, and soaps; and, in general, the minor errors

throughout the text have been corrected. It is to be hoped that Dr. Thorp will soon find it practicable to make such additions to the bibliographies as will bring them more closely up to date than is at present the case. H. P. T.

VICTOR VON RICHTER'S ORGANIC CHEMISTRY

VOL. II. CARBOCYCLIC AND HETEROCYCLIC SERIES. Edited by Professor R. ANSCHÜTZ, University of Bonn, assisted by Dr. G. SCHROETER. Authorized translation by EDGAR F. SMITH, Professor of Chemistry, University of Pennsylvania. Third American from the Eighth German edition. 671 pp. Philadelphia, P. Blakiston's Son & Co., 1900.

It is noted in the preface of this edition that in the preparation of the German edition, of which it is a translation, Professor Anschütz availed himself of the services of those of his colleagues who were best fitted to speak with an authority born of experience in the field included in the various chapters, and that on this account the work may be regarded as particularly trustworthy. As the work of the translator appears to have been faithfully and thoroughly done, the American edition possesses the same authoritative character. The indexing appears also to have been done with great care,— a point which counts for much in a book which contains such a quantity of material, in such condensed form, as is the case here. As a reference book, Richter's chemistries have long proved themselves of value; and the present volume is entitled to be ranked with the others which have preceded it.

H. P. T.

INTRODUCTION TO PHYSICAL CHEMISTRY

BY JAMES WALKER, D.Sc., Ph.D. Macmillan & Co., New York and London, 1899.

The appearance of an English work on Physical Chemistry by one who has long identified himself with this new branch of science, not only by his own investigations, but also by his well-known translation of Ostwald's "Outlines of Physical Chemistry"

and of his "Physico-chemical Measurements," will be hailed with delight by English-speaking teachers as well as students. While the advanced student of Physical Chemistry has had his needs for text and reference books amply met by Ostwald's classical "Lehrbuch" and Nernst's admirable "Theoretische Chemie," the beginner has been obliged to fall back upon Ostwald's elementary treatise, which, being a very abbreviated edition of the "Lehrbuch," is not well adapted to the needs of a student approaching the subject for the first time. Dr. Walker's book fills, therefore, a real need in our chemical literature, the more felt as instruction in this subject is finding a more and more important place in the curriculum of all our leading universities and colleges.

As to the book itself, the author states that it "makes no pretension to give a complete or even systematic survey of Physical Chemistry." And so it is perhaps unfair to make the chief criticism one is tempted to make of the work; *i.e.*, the lack of system and unity which impresses one in going from chapter to chapter. But the matter which is treated of is discussed admirably and at sufficient length to be readily understood by one familiar with elementary physics and chemistry, a knowledge of which is assumed. Only the most elementary mathematics is introduced, the few thermo-dynamical proofs involved being collected together in a concluding chapter.

The treatment is thoroughly up to date; and the author, being a strong advocate of the dissociation theory, has presented this most important subject with a chapter on its numerous applications in a most satisfactory manner. Special mention may also be made of the chapters on chemical equilibrium and chemical dynamics. Electro-chemistry, excepting that portion dealing with the dissociation theory and electrolytic conduction, and photo-chemistry are not treated. The references given at the end of the chapters, for the convenience of those desirous of obtaining further information, might have been extended to good advantage; for the author, in his selection, evidently had in mind English students for whom the German language has no attractions. The book is most heartily recommended to all interested in the modern aspect of theoretical chemistry.

H. M. Goodwin.

IRRIGATION AND DRAINAGE

By F. H. King, Professor of Agricultural Physics in the University of Wisconsin. New York, the Macmillan Company.

No one at all interested in the scientific development of agriculture, and especially of that branch which depends upon artificial irrigation, will readily lay down this book after once having taken it up. Its aim is to show the fundamental relations of water to the soil and to plants, and upon the knowledge of those relations to develop a logical practice in land irrigation and drainage. Interesting experiments are recounted by which was determined the actual amount of water required by various growing plants. A thorough discussion is given of the extent to which tillage may take the place of irrigation by conserving soil moisture, as also of the increase of yield under irrigation in humid climates. How plants are believed to supply themselves with moisture from the soil and how they extend their roots into the soil are explained. Consideration is given to the serious problems presented by the development of alkali salts in irrigated lands, and the proper remedy is pointed out. In fact, there seem to be few questions likely to come to the mind, and fairly within the scope of the work, upon which it does not cast light.

No assumption is made of dealing largely with engineering principles or problems. The book does, however, give an excellent outline of the constructions and mechanical devices used in diverting and in raising water for irrigation. Further, the matter of drainage is most admirably presented; and no engineer who has to deal with problems either of ordinary land drainage or of drainage in connection with sewage disposal can fail to find this part of the work of decided value to him. How drainage ventilates the soil, how it increases the available supply of soil moisture for crops, and how it acts to make the soil warmer are made clear. The principles governing ground-water flow and its entrance into subsoil drains, about which many vague and even erroneous views are unquestionably held, are well stated, and are plainly illustrated

by diagrams based upon observations in test-wells. Very complete practical directions are also given for the construction of pipe systems for land drainage.

The novelty of many of the illustrations attracts the eye. One view shows a field served by sub-surface irrigation, and reveals the difficulty experienced in thoroughly wetting the surface soil in such treatment; another, the raising of water from the Grand River, Colorado, through a height of more than eighty feet, by the unusual arrangement of two centrifugal pumps, one above the other, in series; while a third portrays irrigation by sewage on the Craigentinny meadows about Edinburgh, a load of more than a ton of grass in the foreground representing a single cutting from only a sixteenth part of an acre of this land. The model garden used in Paris to illustrate what may be accomplished in the utilization of sewage as it is applied by that city upon the sandy fields along the Seine, the penetration of roots into the soil, the contrast presented by a field partly under irrigation and partly without that aid, and numerous views illustrating the diverse methods used in applying water are among the features set forth in the large number of photo-engravings which the book contains. These are necessarily small, and some have suffered in clearness in reproduction; but, on the whole, they contribute greatly to the interest of the reader.

This book forms the eighth in the Rural Science Series, to which Professors Brewer, of Yale, Roberts, of Cornell, Hilgard, of California, and various other authorities of the highest reputation are set down as contributors. Its matter is presented with great clearness, and its conclusions are largely based upon a study of careful experiments and upon personal inspection of irrigation practice both in this country and abroad. In its preparation the author has performed a valuable service.

DWIGHT PORTER.

THE RISE AND DEVELOPMENT OF THE LIQUEFACTION OF GASES

By Willett L. Hardin, Ph.D. Macmillan Company, 1899. $1.50.

This volume is divided into four chapters, corresponding to four periods in the development of the liquefaction of gases. The first chapter treats of the early observations on the compression of gases and the few attempts on their liquefaction. The second chapter is devoted to a review of the work of Faraday and other experimenters during the period 1820–1870, and also records the successful liquefaction and solidification of certain gases. The work of Andrews, on the relation of the critical constants, pressure, volume, and temperature to the liquefaction of gases and a general discussion of the continuity of the gaseous and liquid states, form the subject-matter of the third chapter.

The fourth chapter is divided into four sections: —

1. Experiments of Cailletet and Pictet on the liquefaction of the so-called permanent gases. 2. The experiments of Wroblewski, Olszewski, and Dewar. 3. Liquefaction of gases by the regenerative method. 4. Liquefaction of argon, hydrogen, helium, krypton, etc.

Throughout the volume, references to the original publication in the foreign journals are given. To those who are not in a position to consult the original literature, the book offers a history of the development of the methods employed in liquefaction of gases, together with a statement of the underlying principles.

G. V. W.

PUBLICATIONS OF THE INSTITUTE

(*Completed*)

SNOW, WALTER B., S.B., II. (M. I. T.), 1882.

1896. The Fan and Furnace System of Heating and Ventilation. *The Metal Worker*, February 1.

1898. Mechanical Draft (edited for B. F. Sturtevant Company). 8vo. 355 pp. Boston.

1898. The Uses of the Blower in the Foundry. Trans. N.E. Foundrymen's Assn., 1898. *The Foundry*, March. *The Metal Worker*, February.

1898. Mechanical Draft. *Machinery*, serial begun August, 1897.

1898. Some Facts in the History of the Blower System. *The Metal Worker*, serial begun March 19.

SNYDER, FREDERICK T., S.B., VI. (M. I. T.), 1891.

1894. Newton Mortar. *Eng. and Min. Jour.*

1898. Modern Forms of Milling Machinery. *Trans. Federated Canadian Min. Inst.*

SONDERICKER, JEROME, S.B., C.E. Instr. 1885–90; Asst. Prof. 1890.

1896. Notes on Graphic Statics. Pph. Boston. For use of students.

SOUTHER, HENRY, JR., S.B., III. (M. I. T.), 1887.

1898. Influence of Air Pressure in Pneumatic Tires. *Iron Age*, April 7.

SPRAGUE, TIMOTHY W., S.B., III. (M. I. T.), 1887.

1894. Electrical Transmission of Power in Mining. *The Mineral Industry*, III.

1895. Electricity in Mining Work. *Ibid.*, IV.

1896. Electrical Mining Applications. *Ibid.*, V.

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The Technology Review

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THE TECHNOLOGY REVIEW is published four times a year: on the first day of January, April, July, and October. The annual subscription is one dollar; single copies, thirty-five cents each. Communications should be addressed to THE TECHNOLOGY REVIEW, 71 Newbury Street, Boston, Mass.

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The Technology Review

VOL. II. JULY, 1900 No. 3

THE M. I. T. ECLIPSE EXPEDITION TO WASHINGTON, GA.

In the fall of 1899 the Corporation of the Massachusetts Institute of Technology made an appropriation from the Austin Fund to send a small party to observe the total solar eclipse of May 28, 1900.

The equipment of the Geodetic Observatory of the Civil Engineering Department was quite sufficient for the observations of local time, latitude, and longitude. By adding to this equipment two equatorially mounted telescopes, the party was furnished with all necessary instruments for the determination of the times of the four contacts; and nothing beyond this was originally contemplated.

During the fall term of 1899 a careful study was made of the track of the moon's shadow plotted on the best maps, searching on the central line for the town of highest altitude and of easiest approach. The little city of Washington, Ga., seemed to fulfil the conditions. On consulting the pamphlet and diagram prepared by Professor Frank H. Bigelow, from meteorological observations taken during the past three years along the path of the eclipse, it was found that, although the place itself was not mentioned, the region was one most favorably situated with reference to probable cloudiness. Immediately correspon-

ence was begun with the local postmaster. Fortunately for our party, the postmaster, Mr. J. E. Poché, proved to be a man among a thousand,— one who appreciated our work and heartily assisted us from the beginning to the end of our undertaking. It was from him that we learned that the little city was supplied with good modern hotels, and was "a centre of culture and refinement." We were sceptics, however, and did not believe until by actual experience we found the promises more than fulfilled by the reality.

The party was placed in charge of the writer, and at first Professor Arthur G. Robbins and Mr. George L. Hosmer were the only other members. Later our number was increased by the addition of three volunteer observers,— Professor Dana P. Bartlett, Mr. Walter Humphreys, and Mr. Harrison W. Smith, all from the Institute. These new men made it possible to extend the programme of work, and to make it include magnetic observations and the sketching and photographing of the corona. None of the Tech party could properly be termed astronomers, and no new line of research work was deemed advisable.

In April, Mr. J. Rayner Edmands (M. I. T., '69) of the Harvard College Observatory, went South to look over the place selected by the Harvard eclipse party in Greenville, Ala. Mr. Edmands very generously offered to look in on Washington, Ga., on his way South, to sample the hotels and look about for a favorable site for our instruments. Soon there came an assurance from Mr. Edmands that "we had landed on our feet" in selecting Washington. Later there came a transfer of Harvard, Blue Hill, and Flagstaff parties to this point. The last arrangement was a happy one, beneficial to all concerned.

By the first week in May the new equatorials of five and

three inches' aperture, ordered from the firm of Alvan Clark & Sons, Cambridge, were completed. These telescopes were fitted with eye-pieces and shades especially devised for eclipse work by Mr. Lundin, and proved most satisfactory in every way.

A Typical Residence, Washington, Ga.

On May 9 the writer sailed from Boston on the Savannah steamer, which had on board the outfit of the Harvard, Blue Hill, and Technology parties. The largest part of the freight was the box containing the cluster of cameras for Harvard's intra-mercurial research. This was later to have a house built about it and to be mounted equatorially. On arrival in Savannah it was found that the freight just filled

a large box car, and here it became evident to the writer that some kinds of freight even more than tourists needed to be "personally conducted." In spite of "smashers" and railroad wars, it finally landed safely in the Washington, Ga., depot.

Washington, Ga.! It is now a name to conjure with!

City Square.

The little mule-car that hauls you from the depot to the hotel prepares you for something quaint and picturesque; but the picturesqueness is dispelled on entering the brand-new hotel, with its electric lights, its baths and large airy rooms, to be restored when you look from the windows on the City Square with its old court-house and the crowd of jet black negroes with their nondescript mule teams. You

take a stroll about the town, and you learn that the place is rich with historical associations. On all sides are the great magnolia-trees in full bloom, gardens running over with rose-bushes, shaded walks and drives leading to stately old mansions surrounded by colonnades reaching to the eaves.

"Colonnades to the Eaves."

After a while you begin to ask questions, and wonder why you have not known of this town before. The answers to your questions gradually make things clear. This town has long been the abiding-place of the best blood in Georgia. It is the heart of the old Confederacy. It is here their great leaders were born, and it is here they came

back to live in the days following the war. The old town, uninjured materially by the actual struggle, offered the balm of repose and serenity. No tourists came here, and no curious tourists were desired. But the contrasts! The very new stores, the electric lights in the shop windows, the telephone, all give a check to sentimentalizing. Now is

On the Road to the Eclipse Station.

the day of the new generation without war memories. The hotel is the growth of the present year. It is not long that the Square has been sprinkled from the hydrant, and to-day they are laying the first sewer pipes in the streets. It has not, however, the "hustle" of the Western town. The darkies dig the sewer ditch to a drawling tune, and no hasty shovel or pick mars the rhythm of the movement.

Here is the home of General Robert Toombs, who would not have a hotel built in the place as long as he lived, who said, "If any respectable stranger comes to this town, he is welcome to my home; and, if he is not respectable, we do not want him." Close at hand Alexander H. Stephens was born. You hear many interesting anecdotes of these

Where Jefferson Davis held his Last Cabinet Meeting.

leaders, and those who still bear their names are not a few. Here Jefferson Davis held his last cabinet meeting. The town may be said to have been the birthplace and death-bed of the Confederacy. The town is very old, and was named for General Washington before the site of the capital in the District of Columbia was selected.

Nothing could exceed the generous welcome which these

warm-hearted Southerners extended to the little Yankee party of eclipse seekers. It would be out of the question to think of telling of the eclipse without some preface about the people and the place.

The site selected by Mr. Edmands was certainly the best to be found, and on the first day after arrival the ground was staked out for the location of buildings and instruments. An observation on Polaris gave the north and south line for orienting the piers and buildings. The brick and cement pier for the astronomical transit and the building for the Harvard big camera were well advanced before other arrivals from the North reached Washington. Mr. W. H. Attwill, of the Harvard party, was the first to come and get to work. His heroic struggles with "Jumbo," as the big camera was called, are a matter of town history now. Next to arrive was the representative of the Boston press, Mr. William H. Hills of the *Globe*, accompanied by his wife. They proved to be a most pleasant and congenial addition. Then followed Professor W. H. Pickering of Harvard and Mr. George L. Hosmer of the Institute of Technology. The preparations went steadily on from the first day, and each one seemed to be on hand at the right time for his special work. Mr. Hosmer began the adjustment of the astronomical transit, and soon we knew the latitude and the local time to a fine point. A wire was put up connecting the observatory with the Western Union Station in the town, and then the ticks of the astronomical clock in Washington were received on the spot. The local sidereal time recorded on our chronograph and the time signal from Washington, D.C., enabled us to compute the longitude. We knew that the maps of this part of Georgia were not controlled by triangulation, and it was not to be expected that the latitude and longitude of the town could

be accurately scaled from the map; but we hoped that they were somewhere near right. The only way was to make an independent examination, and then, if necessary, to revise the figures for the predicted times of contacts and for the period of totality. From maps the latitude of Washington, Ga., was found to be N. 33° 40′ and the longitude W. 82° 42′, or five hours, thirty minutes, forty-eight seconds. By direct observation the latitude was found to be N. 33° 43′ 49″, and the longitude obtained by means of

Astronomical Transit.

the time signal was W. five hours, thirty minutes, fifty-six and two-tenths seconds. This moved the station over four miles north and nearly two miles west. We were sorry to find this change, as it carried us off the central line and reduced the period of totality about two seconds. We had to make the best of it: two precious seconds were lost. The times of the contacts were recalculated, and we knew where we were and when to expect the eclipse.

During the week before the eclipse we erected a second small brick pier to mark permanently the north and south

line. This was done for the benefit of local surveyors in Washington, Ga.; and we made a small map showing the location of the piers and all the instruments with reference to the nearest road and house. We also observed the dip and declination of the magnetic needle. Mr. Hosmer and the writer were fairly well occupied both day and evening. While Mr. Hosmer made the time and latitude observations, it was often found expedient to divert the visitors (who were always with us) from the vicinity of the more delicate instruments. Therefore, in another part of the cotton field was set up one of the equatorials; and the

Equatorials.

visitors were entertained by showing them the crescent of the planet Venus and the moons about Jupiter.

On Tuesday, May 22, all of the Northerners who had arrived were invited to a very pleasant afternoon tea given by the ladies of the Frank Willis Literary Club. The gentleman for whom this club was named was the local philanthropist, and to him is due the excellent public library which the city possesses.

Professor Pickering gave two popular lectures on the eclipse,— one before the literary club and one at the high school,— and enlisted some twenty assistants to work his many cameras.

On Saturday, the 26th, the astronomers began to assemble in good earnest. Mr. A. Lawrence Rotch and Mr. Ferguson, of the Blue Hill Observatory; Mr. A. E. Douglass, of the Flagstaff Observatory; Mr. J. Rayner Edmands and Rev. Mr. Saville, from Cambridge; Professor Arthur G. Robbins, Professor Dana P. Bartlett, and Messrs. Humphreys and Smith, from Technology,— all came on that day. In the evening Mrs. W. H. Pickering, Miss Russell, and Miss Michaelis, from Cambridge, arrived. That night the Hotel Fitzpatrick wore quite a New England aspect.

Five young ladies of Washington, Ga., skilled in drawing, were enlisted to help Mr. Humphreys and the writer in sketching the form of the corona. Teachers and pupils of the high school to the number of twenty had volunteered their services to Professor Pickering. These latter assistants, together with the regular corps of observers, made a little army that had to be drilled several times before the critical moment, as all success in eclipse work must depend upon every one knowing, without question, exactly what he is to do and when he is to do it.

At the grounds of the Catholic Orphanage and Seminary another group of astronomers was gathering,— Father Charropin and Professor Frumveller, of St. Louis; Father Rigge, of Omaha; and Professor Quinlan, of Cincinnati.

Sunday, May 27, was the busiest day. Even those of our party who always went to church before forgot to go this morning. To minds filled with scientific enthusiasm Sunday was simply the day before the eclipse. Ropes were stretched around our corner of the cotton-field, and few visitors were admitted within. The sketchers now received some practice as nearly under the expected conditions as possible. A word about our sketching-class. On

the sketching-stand, erected days before, there was tacked to an inclined board the paper, already supplied with the black disk for the moon, together with vertical and horizontal lines and concentric circles to aid in estimating distances. Above the upper edge of this board was stretched a horizontal wire, and short vertical wires crossed this one in front of each sketcher. The practice consisted in drawing from various diagrams of the corona held up on the end of a pole, so as to appear at about the proper angular elevation for the sun. The time of sketching was regulated by calling out the seconds to the number of eighty-five. The

Sketching Class.

young ladies were asked to sketch each a single quadrant. Mr. Humphreys and the writer had practised a little longer, and attempted the whole corona.

The idea of sketching was to try to show the impression made by the coronal light on the eye, as distinct from the impression made on the photographic plate. To those who have carefully watched the corona, the photographs have always seemed unsatisfactory; sketches, perhaps even more so, but in an entirely different way. Photography of such a light, gauzy thing as the corona is different from other kinds of photography.

All observers and their assistants were drilled to-day in

their several duties to the counting of the strokes of the metronome by Professor Robbins. White sheets were spread upon the ground and tacked to the side of a building for observing and photographing, if possible, the elusive "shadow bands." Meteorological instruments were set up, and began recording automatically the elements of the weather.

During the afternoon a telegram of prediction came from

General View of Eclipse Station.

the Weather Bureau, worded in language to suit the most optimistic.

As night approached, the plate-holders had to be filled. By eleven o'clock nearly everything was ready, and a night watchman was hired to remain on the ground and keep awake until five in the morning. Most of the parties retired then to the hotel. That night some slept five hours, some two hours, and some half an hour. At five o'clock next morning a few were back on the cotton-field. At half-past six the field was well peopled, and all was in readiness.

At seven hours, two minutes, twenty-two and seven-tenths seconds local mean time, Mr. Hosmer, looking through the large equatorial, silently recorded on the revolving chronograph the first contact. Six and three-tenths seconds earlier Professor Robbins, with the small equatorial and a stop watch set to the local mean time chronometer, had observed independently the same event. The eclipse was on! The sky was clear beyond the wildest hopes! Every one was cheerful.

Magnetometer.

The hour before totality was used for the final drill. Kodak fiends now got in their work on the absorbed groups. Professor Bartlett began observing and recording the readings of the magnetometer, the object being to determine whether any changes in magnetic declination would occur during the progress of the eclipse. Smoked glass was freely used. The crescent images of the sun were watched as they fell on the ground between the shadows of the interlaced fingers. The cotton-field not furnishing trees to illustrate this well-known phenomenon, we had to be contented with producing the effect by personal effort.

When the time arrived, "Twenty minutes before totality" was announced, and the uncanny darkness of the sky began to be felt. At "Ten minutes before totality" there was a tendency to speak of the chilliness, and there arose a very slight breeze. Those nervously sensitive felt much more of a chill than the cold-blooded thermometer would justify, the entire drop not being more than five degrees. At "Five minutes before totality" those who were going to sketch took their places behind the sketching-stand, and closed their eyes, not to open them until they heard Professor Robbins counting the first "One" of the seconds. These moments of waiting seemed the longest of the day. There was a general hush of expectancy, and Professor Pickering's announcement of "The Shadow" was the first word to interrupt the quiet. Then the call was given to the shadow-band observers, and almost immediately a loud, clear voice was heard counting "One — two — three."

My eyes opened on a view for which they had been prepared; but the beauty of the spectacle kept the sketching pencil unemployed for several seconds. At first there seemed to be but two broad streams of light, with very sharply defined and nearly parallel edges, extending — the one upward and to the right, the other downward and to the left — from a jet black disk, all against a background of dark blue sky. The polar streamers were not noticeable to the naked eye at the first glance, so strikingly brilliant were the equatorial rays. There was the faintest tinge of lavender in the light of the corona, and the inner contour of brightness was fairly well marked at the upper side. There was plenty of light for sketching. Aside from the voice calling the numbers, there were no sounds now but the scratching of the pencils and the mechanical clicks of the different pieces of apparatus. "Eighty-five — eighty-

six." It was over. If you had done the thing you ought not to have done or had left undone the thing that you ought to have done, it was too late now for anything but confession.

As far as we could tell at the time, all of our little party had done what they had planned to do. Mr. Harrison W. Smith, with his camera, had made six exposures of different lengths of time. He was assisted in this work by Mr. Irving M. Callaway, a Washington young man. Mr. Smith's ingenious device for following with the camera the motion of the sun needs special mention. Below is given his written description of the instrument, accompanied by a photograph.*

At thirteen minutes after totality a briet cablegram was sent by Mr. A. E. Douglass, of the Flagstaff (Ariz.) Observatory, to Mr. Percival Lowell in Tripoli, Africa: —

DAIX, TRIPOLI, AFRICA.— Corona similar 1889. Shadow bands, biograph and small cameras entirely satisfactory, moon's shadow visible on sky.

DOUGLASS.

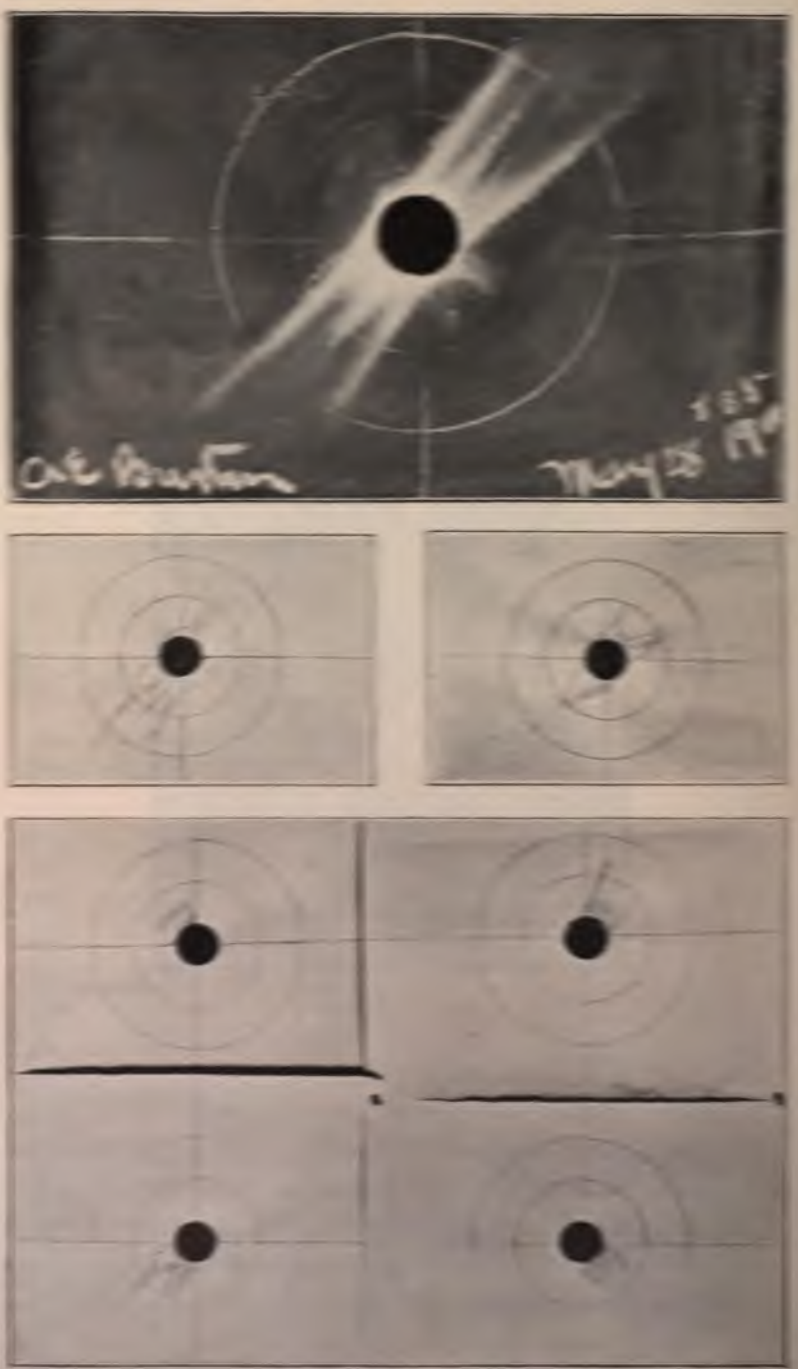
This cablegram left the cotton-field over our telephone wire to the Western Union Telegraph Station in Washington, Ga., at eight hours, twenty-four minutes A.M. local time,

*The camera with which the photographs of the corona were taken consisted of a wooden box, with the reversible back of an ordinary 4 x 5 camera attached at one end and the lens at the other. The lens was borrowed from a small telescope, and had an aperture of three inches and focal length of forty-three inches. In order to make the long exposure, it was necessary to provide some means of following the motion of the sun; and this was accomplished by mounting the lens end of the camera on hinges and supporting the other end on a tangent screw. The base of the camera was securely mounted on posts, as shown in the photograph, being tilted so that the plane of motion of the camera about the hinged end should be parallel to the plane of the earth's equator. The tangent screw was operated through a series of gear-wheels, by means of a small crank, shown in the photograph at the lower end of the base of the camera. The ratio of the gear and the pitch of the tangent screw were such that one-half a revolution of the crank would cause the camera to rotate through an angle of fifteen seconds. Consequently, by rotating the crank at the rate of one-half revolution each second, the desired result was obtained. It was found that, by following the beats of the metronome pendulum or listening to the counter, the driving could be made sufficiently uniform by hand. The plate was protected from reflection from the inside of the camera box by means of a series of screens distributed along the inside.

at one hour, fifty-five minutes Greenwich mean time. It was received by Mr. Lowell in Tripoli at two hours and five minutes Greenwich mean time. The actual time of transmission of this message from one man to the other was ten minutes. It arrived in Tripoli two hours and thirty

Smith's Camera.

minutes ahead of the moon's shadow, which was travelling across the earth at the rate of one thousand miles an hour. Mr. Lowell had made special arrangements with the cable companies for hastening this despatch. A return cablegram from Tripoli arrived at Washington, Ga., 11 P.M. In general conversation in Washington on this day, these cablegrams and the eclipse divided interest equally.



Composite Sketch and Sketches made during Totality.

Twenty-four minutes after totality the writer finished a pastel memory sketch of the corona; and this and all the sketches finished during the period of totality were then sealed up, and remained untouched until photographed in Boston.

Professor Robbins and Mr. Hosmer made the last scien-

Georgia Barbecue: Roasting the Animals.

tific record of the day, the time of fourth contact. Below are given the figures from the chronograph sheets for all the four contacts in local mean time: first contact, 7 hours, 2 minutes, 22.7 seconds; second contact, 8 hours, 9 minutes, 52.0 seconds; third contact, 8 hours, 11 minutes, 18.2 seconds; fourth contact, 9 hours, 28 minutes, 26.9 seconds.

At fourth contact the eclipse is over! All are happy, and seek the hotel for breakfast.

Now there seemed nothing to do but to pack up and leave for home. No, we were reckoning without our hosts. The ladies and gentlemen of Washington had arranged a barbecue in our special honor. Every eclipse seeker was invited. All had heard of a "Georgia barbecue," or, rather, a Georgia "cue"; but few had experienced one. The meat

The Barbecue: Just before Dinner.

roasted to a savory crisp over the pit of live coals, the hotly spiced "Brunswick stew," served under the trees in the midst of pleasant company, will be a memory long to survive. The *chef* of the "cue" was the jolly sheriff of the town, whose very appearance was a guarantee of connoisseurship in things edible. The "cue" formed a fitting climax to a most pleasant trip; and on Tuesday afternoon the "Tech" party started North, feeling, as our expert in photography expressed it, "what a pity it

was that eclipses never struck the same place twice in a fellow's lifetime."

ALFRED E. BURTON.

JULY 1, 1900.

Volunteer Observers.

INSTITUTE MEN AT WADESBORO, N.C.

Although the Institute eclipse party proper was in charge of Professor Burton at Washington, Ga., the Institute was also very prominently represented at what was probably the largest station along the line of totality, Wadesboro, N.C. Here Professor Hale, Course VIII, 1890, was in

Professor Hale's Bolometer-house, Spectrascopes, and Siderostat.

charge of a large party from the Yerkes Observatory, and Mr. Charles G. Abbot, Course VIII, 1894, was in charge of the Smithsonian party organized by Professor Langley. The Yerkes party was also assisted by Professors Noyes, Laws, and Goodwin, of the Institute; and Mr. Abbot was assisted by Mr. Frederick E. Fowle, Jr., Course VIII, 1894, a member of the regular staff of the Astro-Physical Observatory of the Smithsonian Institution. When it is also remembered that the Harvard Observatory party included Professor J. R. Edmands, 1869, with Professor

William H. Pickering, Course VIII, 1879, in charge, and the Blue Hill Observatory party was in charge of Mr. A. Lawrence Rotch, 1884, it is certainly astonishing to find so many Institute graduates now prominent in astronomy. That the training given in our college should prove so successful a foundation for a career in the purest of all the sciences, speaks volumes for the breadth and scientific foundation of that training.

Besides the Yerkes and Smithsonian parties at Wadesboro were Professor Young's party from Princeton, and the Rev. Dr. Bacon's party from London, the only European expedition which visited this country. There were, besides, numerous private observers. Professor Young stated that never before had such valuable apparatus been collected and such elaborate preparations been made at any one place for observing an eclipse as at Wadesboro. The work planned by the various observers was very comprehensive. Professor Hale and Mr. Abbot attacked independently the previously unsolved problem of the heat radiation of the corona with the aid of the bolometer; a small but undoubted radiation, somewhat greater than that from the moon was detected. Professor Barnard, of the Yerkes Observatory, and also several members of the Smithsonian party, undertook the photography of the corona on an unprecedented scale. Professors Young, Hale, and Frost made an elaborate study of the spectra of the "flash" and of the corona. A search was also again made for an intra-mercurial planet by the Smithsonian people; and observations were made on the shadow bands and meteorological phenomena by Mr. Clayton, of the Blue Hill Observatory.

The conditions for observing the eclipse were absolutely perfect. The corona was of unusual beauty and brilliancy, as had been anticipated, it being now a minimum sun-spot

Professor Barnard's Great Camera for Photographing the Corona.

Smithsonian Camera for Photographing the Corona.

period. On the other hand, the "corona line" in the spectrum of the corona was so exceedingly faint that it was seen by only one observer at Wadesboro. Whether it was successfully photographed by any one remains to be seen. The scientific value of the many photographs taken can be determined only after they have been developed and reduced; but important results are anticipated. All who went down from the Institute voted the trip a grand success.

H. M. Goodwin, '90.

COMMENCEMENT WEEK

The first of the events of Commencement Week was the cordial reception extended to the graduating class by the Alumni Association. This was, as usual, held at the Exchange Club on the evening of the Friday preceding Commencement Day. About one hundred alumni and one hundred and seventy-five of the class were present.

The half-hour before eight o'clock was occupied in giving and receiving congratulations and in meeting those present in the reception-rooms. At eight o'clock Mr. Leonard, the president of the class, announced that the guests were invited to the spread. After the spread all assembled to listen to the speakers of the evening.

President Miller of the Alumni Association, after a few brief remarks, introduced President Crafts, who was greeted with most hearty applause. President Crafts said: —

Mr. President of the Alumni:

I am glad that in your remarks you alluded to my position in the way that you did, and did not speak of it as en-

tirely one of separation, because I cannot feel that, in taking a small laboratory room and beginning over again the chemical researches which have occupied the greater part of my life, still finding myself working here in the midst of you, I am separating myself from the school or its interests; it is only from its administrative work; and I hope that the opportunities will be many for seeing all those with whom my position has enabled me to have a closer and very friendly intercourse.

To the class of 1900 I would say that our terms of active work in the school have nearly coincided. When you entered in 1896, you had every reason to expect a long administration and a prosperous one, and that General Walker would have the satisfaction of handing you your degrees at the end of your course. On the 5th of January, 1897, everything was changed by the blow which caused a sad and irreparable loss to the school. Some seventeen years before, when the President was chosen, the government of the school selected a man who was young at that time, considering the reputation he had already made,— not much more than forty years old. He was known as an earnest and enthusiastic teacher; a man of strong, genial, and sympathetic temperament; a lover of men, and particularly of young men; a gallant and successful soldier, using while very young his opportunities as a staff officer in the Army of the Potomac to show high executive ability, doing with all his might whatever he had to do. Here was a man of great promise and of great performance; but still there might have been reason to hesitate in making a choice for the head of this professional school, for his university experience had been in teaching Latin and Political Economy, and in this science he had seemed to dwell with special interest upon the element of wilfulness in man's dealing with man. As you know, extreme precision and mathematical methods form the backbone of our school system. Well, it is needless to tell you how General Walker fulfilled his task; but perhaps you do not realize how much it was a field where he had to be a learner before he became

a teacher. I am told that during the first year he was an observer,— he had relatively little to say about how things should be done. Then ever more and more he took the measure of men and things, and became the real head of the whole body. You, as a Freshman Class, did not come much in contact with the President; but you must have heard accounts of his genial intercourse with all the classes, and you will remember the shock that his death caused and the testimonials of affection from all sides.

It is not necessary for me to say anything about the details of my own administration. I found a house in order, and have endeavored to keep it in order. One circumstance gives me regret and great satisfaction. It so happened that my term in office coincided with great accessions to the funds of the Institute, so that between 1896 and 1899 the reports show that the income-bearing funds increased two and a half times. I regret that this money did not come in time to relieve the care and anxiety which always weighed upon General Walker, while carrying out with sublime faith his bold policy of continual expansion. His life might have been spared longer if he had been relieved from anxieties about ways and means. I have had great satisfaction in finding the means in my hands for building at last laboratories, drawing and modelling rooms, which are in many respects the best in the world, which are suitable to the courses of instruction, which are also in many respects a model to the rest of the world.

I hope that a new building for the Physical Department can soon be erected under like favorable conditions. You know that more land has been purchased, which will eventually be covered with buildings to accommodate some two thousand students. If we are crowded with that number, the places could be reserved more and more for regular students, so that classes of two hundred and fifty or three hundred, could be graduated; and that is quite sufficient for one professional school of this character. Some years will doubtless elapse before the land will be covered

with buildings, and during that time the unoccupied ground can easily be laid out as a playground; and it will be more convenient than was the sunken land once used for that purpose, and now occupied by the Walker Building.

By a somewhat unexpected turn of events there are present to address you to-night both the outgoing and the incoming Presidents. I fancy they may each be thinking from different points of view of two lines of poetry,— views taken through opposite ends of the telescope; and you will say that it is probably the astronomer who is looking through the right end. The lines were written by a professor who was more richly endowed with the poetic faculty than are most professors, although that did not hinder him from being a very good lecturer upon anatomy. I have in mind Dr. Oliver Wendell Holmes. The lines are: —

> "Uneasy lies the head that's born to rule,
> And most of all whose kingdom is a school."

And now I have a pleasant task to perform,— that of introducing to you the President-elect. It might seem superfluous, since your studies have ceased. He will not have the task of overseeing your work, nor the privilege of handing you your well-earned diplomas,— a privilege which I value highly,— but will be, I hope, the head of this school through many long years. And no one of you feels that your connection with the Institute ceases when you graduate. If the school has done anything for you, it has done it through the generous aid and support of its friends, and it is now counting ever more upon the support of its alumni; and an excellent support is the evidence of the close and friendly relations which induce you to come back and visit us, to join Tech associations, and to write to us about your careers. I have no doubt the new President will find these consultations with you among the pleasant things in his new duties. We value the free intercourse with alumni who know and love the school, and have often new things to say about it, as they climb ever higher the steep hill of success, and look back upon a broadening landscape.

The new President is not an old man. He seems young to me, and he is a very young man to be called to this place. He is of about the same age as General Walker when he came here. He has the great advantage of being able to outlive some of the things which he does not like, and to live long with the men and the schemes of work which he shall choose and initiate. He comes equipped with the exact knowledge of the mathematician, with the experience of a teacher of engineering, and with the administrative capacities which come from playing the part of a man among men at the head of a great governmental department. He comes to find no quarrel to settle, no disorders to remedy, but to receive a hearty welcome and to feel sure of the good will of all. He comes into the acquaintance and good fellowship of the alumni, and that will not be the least of his advantages.

I have the pleasure to present to you Dr. Henry S. Pritchett, President-elect of the Massachusetts Institute of Technology.

President-elect Pritchett received a most cordial welcome. Dr. Pritchett's address was in part as follows: —

I am here to-night, not in an official capacity, but as the latest member of the class of 1900; and as such it is fitting to be modest, and say nothing. But I want to say a few words to you. I come from one of the great engineering bureaus of the country, one of the oldest of government enterprises. There are carried on operations of the highest moment, and the work is so very interesting that a man would not leave unless great attractions were offered him.

Any one knowing the Massachusetts Institute of Technology knows that it holds up the highest standard of technical education, for here it is necessary to learn one thing well. If there was ever any time when that was needed to be done, it is now. Wisely or unwisely, we have come into possessions beyond the ocean where the building of railroads and canals and the development of the country will require the best efforts of American engineers.

Dr. Pritchett then paid a tribute to President Crafts, and continued: —

I desire to be more to you alumni than merely President of the Institute. I desire to enter into personal relations with you. Accept me as a personal friend, and give to me your personal help and advice. And I hope that, as we come to know each other, you will welcome me not only because of your regard for Technology, but for your friendship for myself.

Following Dr. Pritchett, President Miller introduced Professor Robert H. Richards, who spoke of the development during the past years and of the all-important need of alumni interest for the future growth of the Institute. The school would be what the alumni made it. President Miller then presented Dr. Mixter of the class of '75, who alluded somewhat humorously to his Institute days and the old-time Commencement. The last speaker was Mr. C. M. Leonard, president of the class, who thanked the alumni for their most cordial welcome. The Glee Club gave several selections during the evening. For Dr. Pritchett's address, as well as the following addresses, thanks are due to the courtesy of the TECH.

Upon Saturday evening, the 2d, the Glee, Banjo, and Mandolin Clubs tendered a concert to the graduating class and friends. Although a number of the members of the clubs were unable to be present, the concert was most successful. Huntington Hall was crowded, and the audience was a most appreciative one.

The class met in Trinity Church upon Sunday for the Baccalaureate Sermon, which was delivered by the Rev. George Hodges, of Cambridge. Although the day was far

from pleasant, the church was crowded with the friends of the graduating class. The following is the Baccalaureate Sermon: —

"And the Lord added to the church daily such as should be saved."— Acts ii. 47.

They stood where you stand, at the beginning. They had in their hearts the same strong desire which you have: they wanted to succeed.

It is true that they expressed it differently: they stated it in the phrase of the church rather than in the phrase of the street. What we call success they called salvation. "What shall we do," they said, "to be saved?" But the difference is chiefly in the words. They had in their minds what you have in your minds to-day. For to be saved is to succeed supremely.

It is true that success commonly suggests something secular. We call a man successful who gets on in his business, who makes money or a name. And salvation, in common speech, suggests something spiritual: the saved man is he who is sure of going to heaven when he dies. But neither of these definitions is sufficient. *Salvation*, properly understood, is spiritual soundness. It means sanity and strength; it is the good health of the whole man. And it has to do with this present life. We are saved when we are delivered from our sins, and are strong in conflict with temptation, and are open and receptive to all high influences, and live the life which befits a son of God. To be saved is not to be admitted through a gate into a garden, and thenceforth to look out between the palings at the dusty road. The essential thing is not where we are, but what we are. The heart of salvation is not a better place, but a better man. And that, you see, is the definition of all good *success*. That is what you want. In the new life for which you have been preparing and into which you are now entering, you will not be content to be chemists or electricians or engineers or captains of industry: these are excellent callings, but they will not satisfy you. No! the supreme ambition which you have

is to be a man,— to be a sturdy, straightforward, erect, clear-eyed, right-minded man. To be less than this is to fail. It is to belong to the defective classes. Blind Tom, for example, was an extraordinary musician; but he was not a man, in any true sense. He was an idiot. In the same way, one may be a capital workman, scholar, architect, administrator, and yet not be a man. He may be defective in mind or in morals. He may be a machine or an animal. The essential quality of manhood is character. And to attain character is at the same time to succeed and to be saved. Here the two meet. Without character there can be neither salvation nor success.

Success, then, is not so much a commercial as a spiritual matter. It depends not on what we get, but on what we are. It is founded on character. And, because character is so profoundly affected by religion, success and religion are vitally related. Thus it is that you mark this great transition out of the life of apprenticeship into the life of responsibility by a religious service: you ask for counsel at the lips of a minister of religion.

Let us remember what was said upon a like occasion, when the apostles were the spiritual advisers. It was on the Feast of Pentecost, whose anniversary is being kept to-day in the church. Men were stirred with a strong sense of discontent with themselves, and were pressing forward into a new and different way of living. The past they had thrust behind them; their faces are set, as yours are, towards the future. "What shall we do to be saved?" What shall we do, that we may live aright, that we may the better draw near to the ideal, that we may the more effectively serve our fellow-men and please God? What shall we do to succeed? What shall we do, that we may in the fullest sense make the most of ourselves?

What did they do? We read that the apostles told them to ally themselves with the Christian society, and that, accordingly, they were added to the church. The Lord added to the church daily such as desired to be saved. The men were taught that, if they wished to suc-

ceed, if they wished to grow in strength of character and in the spirit of service, they must be socially-minded, they must take their place in the new fraternity of the brethren of the ideal life.

This is the Whit-Sunday lesson which I would bring out of that old time into this present. Let me state it with all frankness. There are many things which we desire of you, but the one of which I purpose to speak is this: we want you men, for your own sake and for the general good, to come to church. You will go back in a few days to your several homes in various parishes. You are to be men of leading in your community. The minister will wait to see in what direction you will lead, whether you will help him or not. He may not say anything to you: the minister is somewhat reluctant to ask a man to come to his church,— more reluctant perhaps than he ought to be. He may not ask you; but he will look at you as the Master looked at the rich young ruler in the gospel, with affection and with expectation. He wants you more than you can know. He notices your presence and your absence. The church may be full — of women: thank God for their devotion, for their helpful enthusiasm, for their splendid maintenance of all good causes. But the minister will miss you if you are not there. He will account all his other success as of no value if he does not succeed in winning and keeping you. Let me say that for him, since he is not likely to say it for himself. It makes a difference, such as I am sure you do not realize, whether or not you are in church.

Consider it in these two aspects: first, as it concerns the best interests of the individual; and, secondly, as it concerns the service which he should render to the community.

It is characteristic of human nature that it needs times and seasons and appointed places. That which is best in us often waits for suggestions from without. So that he who says, I can shape my character outside the church as well as in, I can minister by myself in my own way to

my own life, is altogether likely, after the first enthusiasm, to find himself neglecting that which he honestly intended to perform. Solitude, whether social or spiritual, is excellent for an hour or a day; but it is not the natural state of human beings. All experience shows that we need society. Thoreau spent but a year in his seclusion at Walden Pond. The hermits stayed longer, and fared worse. It is hard enough, under the best conditions, to live the life which is appropriate to a member of the family of God. He who tries to live apart from the rest of the family adds to the difficulties, of which there are enough already. While he who resolutely, week by week, keeps in vital relation with the religious institution, and hears the word of exhortation and instruction, and takes upon his lips the sentence of prayer and praise, is thereby helped and strengthened. He sees ideals clearer, and meets temptations better, and thinks higher thoughts. Is there any doubt about it? Is it not good philosophy? Is it not in accord with universal human nature?

The question, then, is how to be of service to the neighbor. And the answer is that every man may be of service in two ways,— by his good example and by his alliance with the great beneficial forces. For both these kinds of service there is an especial opportunity every Sunday morning.

For he who identifies himself with the Christian Church sets a good example. That is plain enough. He himself may be in much or little need of what the church can give him; but somebody else, who is affected by his example, needs the church, and needs it imperatively. Somebody there is whose destiny may depend upon what he gets at church next Sunday. There he may hear a word in service or in sermon, or in the silence of his own soul, which will make an everlasting difference with him. As he turns the corner to the church, he will change the whole direction of his life. But he waits for you. He waits to see what turn you make; and, when you pass by without going in, he follows in your steps.

You say to him as plain as words, "The church is not worth while"; and he is obedient to that advice. Every citizen who stays at home on Sunday, forsaking the institution to live his individual life, hangs out a flag at his front door, inscribed, "The church is not worth while." And, the wider his influence in the community, the bigger the letters in which that legend is set forth. Every Sunday every man in the neighborhood has a definite opportunity to serve his fellow-men by his good example.

Here is the Christian Church with all its manifold shortcomings, with its weaknesses and sins, with its grievous divisions and contentions, with its neglected opportunities, — what other agency even remotely approaches it in its social possibilities or in its spiritual results? Here may the man of affairs consecrate his executive strength to the best service of his fellow-man, to the marshalling of the hosts of God against the armies of the devil. Here may the scholar bring his wisdom and his devout pursuit of truth into relation with the daily needs of men. Here may the young man bring his manhood, bring his courage and his hope, bring his high enthusiasm, and devote it to the holiest of missions, beginning the week as the knight began his quest, with his sword and shield laid down before the altar.

We must confess, indeed, that the church is not everywhere a young man's church. You may not feel at home in it. You may find that it is conservative when you desire to be progressive. Going out into your new life with large ideas, the church may seem to you to be occupied with petty interests. Concerned as you are in the whole range of human life, upon which you have looked from the academic heights, the church may seem remote and isolated, and out of relation to the common day. Compel it, then. Take it by storm. Do your best to make it what it ought to be.

Gentlemen of the class of 1900, we cannot realize these ideals without you. They are worth realizing: that is plain. To make them effective in any community is to render a

high service to humanity. A church into which men go to worship God, and out of which they come to serve their fellow-men, is the best blessing that any neighborhood can have. Whether there shall be such a church in your neighborhood depends in large measure upon you. You desire to succeed. You look out to-day into the future, praying for that, planning for that. And success means the culture of your character and the best use of your power. You need the church even more than the church needs you. For your sake, for your brethren's sake, you need to be added to the church.

Monday, the 4th of June, was Class Day, the exercises being held, as usual, in Huntington Hall, at half-past two. The hall was very tastefully decorated with palms and festoons of evergreen. Upon the platform were the Class Day officers and the committee, the officers being the following: First Marshal, Percy Rolfe Ziegler; Second Marshal, Walter Louis Rapp; Third Marshal, Marcy Leavenworth Sperry; President of 1900, Clifford Milton Leonard; Historian, Herbert Milton MacMaster; Statistician, Newitt Jackson Neall; Prophet, Frederick Hosmer Cooke; Poet, Herbert Holmes Howe; Orator, Charles Van Merrick. The full report of the addresses is given in the Commencement number of the TECH.

After the conclusion of the exercises the First Marshal cordially invited all to the spread served on the lawn between the Rogers and Walker Buildings. This formed a most pleasing innovation, in former years the spread having been held indoors. Entirely surrounding the lawn was placed a dense row of evergreen trees, which effectually enclosed the space and gave a pleasant effect to the scene. Chairs were provided, and the refreshments were at the side facing Newbury Street. A stringed orchestra played dur-

ing the spread as also during the intermissions in Huntington Hall.

The Commencement exercises occurred on the afternoon of Tuesday, the 5th, degrees being then granted to one hundred and seventy-eight members of the class. Huntington Hall was filled to overflowing, and many were unable to find seats. The class filed in as a body, the centre of the hall being reserved for them, and arose when the Faculty and Corporation appeared upon the platform. After a brief introduction by President Crafts, short abstracts of the following theses were read: —

COURSE I.— Clinton Draper Thurber. "Experiments to determine the accuracy that may be attained with the Pitot tube in the measurement of the flow of water through pipes."

COURSE II.— Arthur Clarence Walworth, Jr. "An investigation of the friction of steam in elbows and bends."

COURSE III.— Stephen Badlam. "An investigation of the effect of annealing upon the physical properties and micro-structure of a low-carbon steel."

COURSE IV.— George Burdett Ford. "Design for a university library."

COURSE V.— Harry Martin Thayer. "The recovery of zinc from pyrite residues."

COURSE VI.— Leigh Shelton Keith. "A study of the wave forms in the three-wire generators of the Institute plant at Trinity Place."

COURSE VII.— Harold Sargent Conant. "A study in variation, taking certain features of the shell of the marine gastropod, *Purpura lapillus*."

COURSE VIII.— Grace Langford. "An investigation of the effect of dilution on the color of copper solution, and its relation to the dissociation theory."

COURSE IX.— Joseph Porter Draper. "A review of State legislation since 1890 in regard to trusts."

COURSE X.— Stanley Gay Hyde Fitch. "The mercerization of cotton, with the addition of aluminates, silicates, glycerine, and glucosides to the mercerization bath."

COURSE XI.— Charles Mussey Fosdick. "A plan for the disposal of the sewage of Fitchburg, Mass."

COURSE XII.— Robert Coffin Simpson. "Collection and reduction of data for the powering of ships."

President Crafts then addressed the class: —

The Class of 1900,— You have passed with us four years of faithful work, as your degrees testify,— four years of companionship with each other, as some society badges, some offices in class organizations, some remembrances of victories or defeats in team athletics, and, what is far better, many close friendships testify.

The sum of all these is a certain quantum of solid acquirements, which you are going to use as tools with which to do your life's work, and a certain *esprit de corps*, which you perhaps to-day call class feeling, but which, as you join an association of graduates in the East or West, will merge into a Tech feeling. To-day you belong to 1900,— a momentous date. We have nearly finished the century together, and we may consider it an appropriate moment to make up our accounts; and I think our few last moments together cannot be better spent than in considering how far the education you have received here will fit you for the far more important business of educating yourselves through the rest of your lives. I do not mean that you will henceforth do your work alone. You will have plenty of educators in the things and people surrounding you; but it is a slowly acquired and difficult art to learn from things, and one which has only been successfully practised of late years,— chiefly by men of science; while people, even if they have the will, do not often know the way to teach you. They will be chiefly guided by their own interests, not yours; and their lessons will not always be given in the same kindly spirit which, I think, you will be

ready to say is characteristic of the teachers in this great professional school.

Some men will say that many practical things cannot be taught; but I believe that, with a good method, almost anything can be taught. It will be objected that Plato did not teach his scholars to think and write like himself, that Goethe left no school. Yet I would like to see an attempt made by a great thinker or writer to do what is done everywhere by great artists, who teach that most unexplainable thing,—artistic conception. We believe and we practise here on the belief that the art of composition in architecture can be taught; and the world is full of examples of great masters who have had great scholars, when they possessed the rare gift of teaching. I prefer, however, in this brief talk, not to enter upon the consideration of any new field of untried and difficult experiment, but to pass your own work in review. You have mostly chosen occupations where the methods of teaching, although of recent date, are perfectly sure and successful. The old philosophy decreed that speculations regarding man's nature and destiny were the only subjects worthy of attention, but it made so little progress with the methods that we are not much farther advanced than in the days of Socrates. Modern science assumes that it is man's chief business to know everything that can be known, but cares little for knowledge that is not sure. In the quest for the exact and absolute truth she has invented methods of discovery and of control which have changed the whole aspect of human thought, and in her scheme a place is found for every skilful and conscientious worker. Text-books have multiplied till they show just what has been done and just what is wanted for the next step forward. Like the design of some great engineer, the scientific programme is put into the hands of thousands of workers for execution. Each one is assigned a place according to his talents, and an appointed task, to do the thing known or to seek the unknown. In this latter sphere the highest imagination and the most poetic fancy may find scope. You have learned

that the discovery of a natural law is a work of imagination, but a trained imagination, using sure methods and abhorring guess-work. Our lay brethren suppose that we believe nothing until we have completed every possible proof. That is not our method. We use modes of reasoning quite unfamiliar to them, but which we have found to be excellent guides toward the truth. We collect facts, and then we propound a theory which tells how to find and arrange new facts which may support it or may kill it. We are not foolish enough to stop living and acting until the laws we live by are absolutely proved. We use our caution, our skill and experience, to select the surest and most rational assemblage of facts that we can find at a given time, we test them by certain signs known to us, in order to see if they are really coherent; and in such a task empiricism and unskilled labor are worse than useless, but imagination is essential. Then, when all is done as well as it can be done for the moment, we accept the law as a rule of conduct until we can get a better. Truly, faith is the evidence of things unseen.

It has been our duty and our practice to be quite open with you, and to tell what we are sure we know and to confess that many things are beyond our knowledge. Each one of you, according to your several tastes and abilities, has learned to do some one thing well, and intends to go out from here and practise his art; but, what is of more value to you, you have been introduced, if only on the threshold, to new regions of scientific thought by men who have been your teachers and companions, who have gone farther than yourselves, but have made no mystery about their methods, and have taught you at least some of the basic principles by which, for the first time in the history of the world, continuous and unchecked progress has been made.

If I have been successful in describing some of the leading features of the education which you have received here, let me say a word regarding their bearing upon the much longer and more important task which

will fill the years before you. All our records of graduates show that you are likely to remain more faithful to your training than the graduates of any other kind of professional school, be it law, medicine, or divinity. More than nine-tenths of you will do some scientific work. You, perhaps, could not come back here at any given time and pass over again any of the test examinations which the diplomas handed to you to-day testify that you have passed successfully. You will have forgotten most of the dry facts which you have taken in or crammed, but what will remain will be habits and methods of work and general principles. Some men of genius teach these to themselves or seem to get on without them; but you have done well to come to a school to learn them, for the world, in general, made very little progress until they were taught, and well taught, in schools. The day when Liebig opened his laboratory at Giessen, and taught students how to make original researches, marked a new era in the history of thought. The art of assembling things together and making them do the right thing for you, in order to solve some given problem, is a most fascinating art. He who has once mastered it, and learned to love it, will have a happy occupation for the rest of his life.

If I have explained rightly these scientific methods, you will agree that they also nurture the highest qualities of faith and imagination, and subject them to tests more immediate and sure than any other kind of training.

These claims for science are not empty words, as you will find when you join the great army of experts, some twenty to thirty thousand strong, in this country, the integrity of whose lives is shown by the integrity of their works; and none have done more than the graduates of the Massachusetts Institute of Technology to maintain a high standard of professional honor in this country.

And now, in conclusion, let me speak for your teachers, and say that you are a satisfactory set of men to teach. You made up your minds before you came here what you

wanted to do, and did it earnestly. You have been willing to take the work we gave you, and have sometimes asked for more. You have recognized that we have your interests at heart, and that our purpose was the same as yours; namely, to do all we could, and do it in the right way. Most of you have come from homes where you have been taught to believe that the earnest responsibilities of life begin at the age of eighteen or earlier, and not at twenty-two or later. It is not a bad thing to be born into circumstances that give you the advantage of good training, but which do not permit idleness. The knowledge which is now your capital in business is a safe security. Opulence is not always hereditary in this country, and the Daughter of Fortune is too often named Misfortune; and so you are going away from us to scatter north and south, east and west in our great country, or perhaps South Africa and the Eastern Islands, and you bear with you a reputation to sustain, that of the best type of American citizens and of the most honorable of our professions.

You know that you do not get away from our examinations when you leave this place, and that there is a book of record in our archives which, I hope, you will help us to keep well filled with the events of your lives. And I may say that there is no feature so satisfactory in our school work as turning to that book, and finding evidences there that you have built up some substantial structure upon the basis of education which was solidly laid down here. Come back to us, then, as often as you can individually or by reports of your alumni meetings. Keep this school in your remembrance, and help in after years to do for others any good thing which you feel it may have done for you.

The diplomas were then given to the candidates, and the exercises were closed.

Following the exercises, President Crafts held a reception in the new library, Mrs. William B. Rogers and President-elect Pritchett assisting him in greeting the graduating class and their friends.

In the evening President-elect Pritchett was tendered a reception by the Technology Club at its house on Newbury Street, an account of which will be found on another page.

CANDIDATES AWARDED DEGREES IN THE SEVERAL DEPARTMENTS, WITH TITLES OF THEIR GRADUATION THESES

I. Civil and Topographical Engineering; II. Mechanical Engineering; III. Mining Engineering; IV. Architecture; V. Chemistry; VI. Electrical Engineering; VII. Biology; VIII. Physics; IX. General Studies; X. Chemical Engineering; XI. Sanitary Engineering; XII. Geology; XIII. Naval Architecture.

DAVID GUSTAVUS ABEEL (I.), *Catskill, N.Y.* A Design for a Ferris Wheel.

GEORGE ORLANDO ADAMS (V.), *North Andover.* Tests on the Corrosion of Iron.

ELBERT GROVER ALLEN (II.), *Brockton.* A Road Test of a Ten-wheel Two-cylinder Compound Passenger Locomotive. (With P. R. BROOKS.)

HARRISON EVERETT ASHLEY (X.), *New Bedford.* A Study of Alloys of Antimony and Tellurium.

STEPHEN BADLAM (III.), *Dorchester.* An investigation of the Effect of Annealing upon the Physical Properties and Micro-structure of a Low-Carbon Steel.

REUBEN WILFRED BALCOM (V.), *Framingham.* An Attempt to Prepare an ϵ-Oxyacid or its Lactone.

CHARLES EDWARD BALDWIN, A.B. (V.), *Cambridge.* Some Properties of Cellulose Tetracetate.

JAMES EDMUND BARKER (VI.), *Pasadena, Cal.* An Efficiency Test of the Trinity Place Lighting Plant of the Institute. (With R. S. BLAIR.)

MORGAN BARNEY (XIII.), *New Bedford.* Progressive Speed Trials of Steam Yacht "Freelance."

CHARLES AUGUSTUS BARTON, Jr. (VI.), *Ravenswood, Ill.* Measurement of Energy in Polyphase Circuits. (With J. B. CONANT.)

JAMES HERVEY BATCHELLER (III.), *Charlestown.* The Electrolytic

Precipitation of Gold from Cyanide Solutions by the Siemens-Halske Process. (With G. M. HOLBROOK.)

JOHN VAN DERVEER BEEKMAN, Jr. (IV.), *Plainfield, N.J.* The Structural Design for a Municipal Market and Exchange.

ROBERT SHERMAN BLAIR (VI.), *Waterbury, Conn.* An Efficiency Test of the Trinity Place Lighting Plant of the Institute. (With J. E. BARKER.)

INGERSOLL BOWDITCH, A.B. (I.), *Jamaica Plain.* A Project for the Development of the Storage of Beaver Pond Basin, at the Head Waters of the Charles River. (With G. C. GIBBS.)

ALBERT BILLINGS BRIGGS (I.), *Wollaston.* A Design for a Coal-handling Plant for a Railroad.

CHARLES CALVIN BRIGGS, Jr. (XIII.), *Pittsburgh, Pa.* A Design for an Ocean Tugboat.

HENRY MATTHIAS BROCK, A.B. (VIII.), *Roxbury.* An Investigation of the Electrical Conductivity of Fused Salts. (With A. S. PECK.)

MILES ELIJAH BROOKS (I.), *Boston.* A Plan for the Abolition of Grade Crossings on the Boston & Maine Railroad at Everett, Mass. (With W. C. TUDBURY.)

PAUL RAYMOND BROOKS (II.), *Chicago, Ill.* A Road Test of a Ten-wheel Two-cylinder Compound Passenger Locomotive. (With E. G. ALLEN.)

CHARLES HOYT BROWN (X.), *Wellsville, N.Y.* The Sizing of Cotton Yarns. (With H. T. SHAPLEY.)

CLARENCE CLAPP BROWN (VI.), *Reading.* Wave Forms of Current and Electromotive Force of Phasing Transformer. (With R. M. HOPKINS.)

JOHN WESLEY BROWN (V.), *Newburyport.* The Formation of Formic Aldehyde as a Product of the Partial Oxidation of Ethyl Alcohol and Acetone.

STEPHEN PEARSON BROWN (II.), *Dover, Me.* The Relative Efficiency of Bearings and Lubricants of a Spinning Frame under Mill Conditions. (With G. O. SCHNELLER.)

FREDERICK DELANO BUFFUM (II.), *Winchester, N.H.* An Investigation of an Axial Oil Machine.

EDWARD EVERETT BUGBEE (III.), *Brookline.* The Refining of Crude Copper. (With D. S. JOHNSON.)

ROY GIBSON BURNHAM (II.), *Essex.* Some Experiments on a Shaft Governor. (With T. D. PERRY.)

KARL BURROUGHS (X.), *Somerville.* The Effects of the Absorption of Gases on Sterling Silver.

MARION LOUISE CADE (V.), *Cambridgeport.* The Action of Dehydrating Agents on Ammonium Salts of Organic Acids.

JOHN CAMPBELL (III.), *Pittsburg, Pa.* Methods of Extracting Lead from By-products Obtained in the Manufacture of Lead Oxides.

LLEWELLYN LEOPOLD CAYVAN (V.), *South Boston.* The Estimation of Phosphates in Potable Waters.

WALTER CRANE CHAFFEE (IV.), *Detroit, Mich.* A Structural Design for a Modern Steel Office Building.

WALTER NATHAN CHARLES (I.), *Roxbury.* An Investigation of Modern Grain Elevators, with a Design.

AURIN MOODY CHASE, B.S. (II.), *Syracuse, N.Y.* The Effects of Different Methods of Hardening High-Carbon Steels. (With W. A. EDSON.)

ROBERT HODGEN CLARY (III.), *Seattle, Wash.* A Study of Fine Concentration. (With G. A. TWEEDY.)

RUDOLPH JULIUS CLAUSEN (IV.), *Davenport, Ia.* A Design for a Public Library for a City of 40,000 Inhabitants.

PERCIVAL CHARLES CLOW (IV.), *Orange.* A Structural Design for a Modern Steel Fire-proof Building.

WILLIAM RAWSON COLLIER (VI.), *Atlanta, Ga.* A Study of an Electrically Propelled Vehicle. (With L. W. SHUMAKER.)

FRANKLIN NORTON CONANT (VI.), *Boston.* A Direct Determination of Individual Wave Forms in a 10,000-volt Circuit. (With W. C. DEAN.)

HAROLD SARGENT CONANT (VII.), *Gloucester.* A Study of Variation in the Shell of the Marine Gastropod, *Purpura lapillus L.*

JOHN BANCROFT CONANT (VI.), *Boston.* Measurement of Energy in Polyphase Circuits. (With C. A. BARTON, Jr.)

FREDERICK HOSMER COOKE (I.), *Cincinnati, Ohio.* A Design of a Two-hinged Steel Arch with Riveted Connections.

EDWARD HATTON DAVIS (IX.), *Hyde Park.* The New York Bank Statement and an Inquiry into its Function as an Index to the Financial Condition of the Country.

WALTER CLARK DEAN (VI.), *Dalton. Pa.* A Direct Determination of Individual Wave Forms in a 10,000-volt Circuit. (With F. N. CONANT.)

PAUL HOLMES DELANO (I.), *Kingston.* A Design for a Masonry Dry Dock.

WILLIAM ASBURY DOREY (III.), *Cincinnati, Ohio.* Decomposition of Zinc Sulphate by Heat. (With R. P. ROBERTS.)

JOSEPH PORTER DRAPER (IX.), *Canton.* A Review of State Legislation since 1890 in regard to Trusts.

FRANCIS BIRD DUTTON, A.B. (X.), *Auburndale.* A Process for Making Paper Stock from Flax.

WARREN ADAMS EDSON (II.), *Dorchester.* The Effects of Different Methods of Hardening High-carbon Steels. (With A. M. CHASE.)

SAMUEL BASS ELBERT (III.), *Des Moines, Ia.* Concentration of Copper Ore from Cape Breton.

CARLETON ELLIS (V.), *Keene, N.H.* A Study of Gold Chloride in Solution.

LEWIS EMERY, 3d (III.), *Bradford, Pa.* The Milling of a Nova Scotia Gold Ore, with Special Reference to Concentration. (With W. L. STEVENS.)

ETHEL FRANCES FIFIELD, A.B. (IV.), *Salem.* A Design for a College Settlement.

STANLEY GAY HYDE FITCH (X.), *Dorchester.* The Mercerization of Cotton without Tension.

GEORGE BURDETT FORD, A.B. (IV.), *Clinton.* A Design for a Library for a Large University.

CHARLES MUSSEY FOSDICK (XI.), *Fitchburg.* A Plan for the Disposal of the Sewage of Fitchburg, Mass.

GERALD FRINK (II.), *Seattle, Wash.* A Partial Design of a Logging Locomotive.

WILLIAM HOWARD FULTON (VI.), *Chelmsford.* A Photographic Method of Recording Wave Forms in a 2,000-volt Circuit. (With H. L. MORGAN.)

EDWARD GERALD GALLAGHER (VI.), *South Framingham.* Harmonic Analysis of Alternating Current Wave Form. (With M. C. MOTT-SMITH.)

STEPHEN FRANKLIN GARDNER (II.), *Somerville.* A Design of a Central Heating Plant.

CARL FRIEDRICH GAUSS (IX.), *Colorado Springs, Col.* The English, Russian, French, and German Governments in Relation to the Developing of their own Trade in China.

GEORGE CROCKER GIBBS, 3d (I.), *New Bedford.* A Project for the Development of the Storage of Beaver Pond Basin, at the Head Waters of the Charles River. (With INGERSOLL BOWDITCH.)

JOHN THOMAS FISKE GLADDING (II.), *Providence, R.I.* The Design of an Oil Machine.

FREDERIC STANLEY GOODRIDGE (II.), *Lynn.* Some Experiments on a Pendulum Governor.

LOUIS NELSON GOWELL (IV.), *Weston.* A Structural Design of a Railway Terminus.

MILTON WESTON HALL (VII.), *Evanston, Ill.* An Investigation of the Behavior of the Bacillus of Typhoid Fever in Milk.

STEPHEN MINARD HALL (VI.), *Waverly, N.Y.* Relation of Temperature to Voltage, Capacity, and Efficiency of Storage Batteries.

CYRUS HOWARD HAPGOOD (VI.), *Everett.* An Investigation of Resonance in Alternating Current Circuits. (With T. E. PENARD.)

HARRY MACY HARPS (I.), *Nantucket.* Experiments on the Flow of Water through a Standard Mouthpiece. (With LEWEN F. SEARLE.)

GARABED G. HEGHINIAN, A.B. (XI.), *Marash, Turkey.* A Study of a Septic System of Sewage Purification and its Application at Brentwood, N.H.

DEAN HINMAN (I.), *Taunton.* An Investigation of the Design and Construction of Standpipes.

TOMOKICHI HIROKAWA, B.S. (VI.), *Imabari, Japan.* The Carrying Capacity of Aluminium Wires.

CHARLES WENTWORTH HODSDON (II.), *Cambridgeport.* A Study of Wind Pressure.

GEORGE MYRON HOLBROOK (V.), *Cambridgeport.* The Electrolytic Precipitation of Gold from Cyanide Solutions by the Siemens-Halske Process. (With J. H. BATCHELLER.)

HARRIS GREENWOOD HOOPER (XIII.), *Brooklyn, N.Y.* Tests with a Towline Dynamometer.

BERTRAM CORNELIUS HOPEMAN (IV.), *Rochester, N.Y.* A Study for the Structural Design of an Auditorium.

ROBERT MILNE HOPKINS (VI.), *Evanston, Ill.* Wave Forms of Current and Electromotive Force of Phasing Transformer. (With C. C. BROWN.)

FRANK NELSON HORTON (II.), *Southbridge.* A Study of the Coefficient of Friction at Different Speeds, between Leather Belting and Cast Iron. (With C. F. SUHR.)

WILLIAM BALDWIN HOUGH (II.), *Williamsport, Pa.* The Comparative Strength of Standard Screws and Cylindrical Rods of the Root Diameter.

HERBERT HOLMES HOWE (IX.), *Boston.* The British Soldier in Kipling's Works.

HERMAN REYNOLDS HUNT (XIII.), *New Bedford.* A Collection and Reduction of Data for the Powering of Ships. (With R. C. SIMPSON.)

JAMES WHITTLESEY HUSSEY (XIII.), *Toledo, Ohio.* A Towing Test on a Model of the Revenue Cutter "Manning." (With H. A. MACPHERSON.)

CHARLES CHAPLIN JOHNSON (X.), *Danversport.* The Testing of Protective Paints for Iron.

DANIEL STEWART JOHNSON (III.), *Short Hills, N.J.* The Refining of Crude Copper. (With E. E. BUGBEE.)

HENRY DETRICK JOUETT (I.), *Somerville.* An Investigation of Bumping Posts, with a Design.

WALTER ROBY KATTELLE (IV.), *Auburndale.* A Design for a County Court House.

HERBERT ORESTES KEAY (II.), *Kingston, N.H.* A Design of a Locomotive Repair and Erecting Shop.

LEIGH SHELTON KEITH (VI.), *North Easton.* A Study of the Wave Forms in the Three-wire Generators of the Institute Plant at Trinity Place. (With H. LITTLEFIELD.)

ARTHUR ISAAC KENDALL (VII.), *Somerville.* An Investigation of Certain Bacterial Fermentations occurring in Sugar Solutions.

WILLIAM ALDEN KINGMAN (V.), *South Framingham.* Some New Salts of Selenic and Telluric Acids, and a Study of their Isomorphism.

GEORGE WASHINGTON KNIGHT (V.), *Dorchester.* Some Reactions for the Detection of the Oximes, Hydrazones, and Hydrazides.

GRACE LANGFORD (VIII.), *Plymouth.* An Investigation of the Effect of Dilution on the Color of Copper Solutions, and its Relation to the Dissociation Theory.

LEWIS MORSE LAWRENCE (IV.), *Nashua, N.H.* A Design for a Small Theatre for a City of about 25,000 Inhabitants.

ROBERT HOWLAND LEACH (III.), *Brockton.* Concentration of Low-grade Pyritic Ore from Eustis, Can. (With F. W. SNOW.)

CLIFFORD MILTON LEONARD (I.), *Chicago, Ill.* Design for a Three-hinged Arch for a Train Shed.

RONDEL MORSE LEWIS (V.), *Malden.* A Study of Certain Reactions for the Detection of the Organic Bases.

EDITH LILIENCRANTZ (IV.), *Oakland, Cal.* A Design for a Villa.

FRANCIS CHURCH LINCOLN (III.), *Boston.* The Milling of a Nova Scotia Gold Ore.

ROBERT ROSS LINGLEY (II.), *Cambridge.* Tests on Superheated Steam.

FRANK WILLIAM LITTLEFIELD (III.), *Peabody.* The Milling of a Nova Scotia Gold Ore with Special Reference to Chlorination and Cyaniding. (With H. C. PLUMMER.)

HOMER LITTLEFIELD (VI.), *Troy, N.Y.* A Study of the Wave Forms in the Three-wire Generators of the Institute Plant at Trinity Place. (With L. S. KEITH.)

FRANCIS HENRY MCCRUDDEN (V.), *Boston.* An Investigation of the Colored Oxidation Products of Diorcinyl Methane.

FRANCIS XAVIER MCGOWAN (II.), *Lawrence.* An Investigation of the Action of an Independent Condenser Air Pump.

HERBERT AUSTIN MACPHERSON (XIII.), *Medford.* A Towing Test on a Model of the Revenue Cutter "Manning." (With J. W. HUSSEY.)

SUMNER MARSHALL MANLEY (II.), *Brockton.* The Effect of Different Initial Pressures on Explosive Mixtures of Gas and Air. (With L. S. SMITH.)

DANIEL ELLWOOD MAXFIELD (II.), *Amesbury.* The Influence of Moisture on the Transverse Strength of Spruce Timber. (With F. D. WARREN.)

GEORGE HOUK MEAD, B.L. (X.), *Dayton, Ohio.* On the Deterioration of Paper.

ARTHUR CLARKE MELCHER (V.), *Newton Centre.* The Constitution of Silver Ammonium Hydroxide.

CHARLES VAN MERRICK (IV.), *Syracuse, N.Y.* A Design for a Chapter House for a Greek Letter Fraternity.

ALBERT SYDNEY MERRILL (X.), *Malden.* A Study of the Strength of Mercerized Cotton Yarns.

GEORGE BARRELL MOODY (XIII.), *Bangor, Me.* The Design of a Mathematical Ship-shaped Solid and the Application thereto of Certain Rules used in Ship Calculations. (With W. I. WYMAN.)

HAROLD LOOMIS MORGAN (VI.), *Springfield.* A Photographic Method of Recording Wave Forms in a 2,000-volt Circuit. (With W. H. FULTON.)

MORTON CHURCHILL MOTT-SMITH (VI.), *Honolulu, H.I.* Harmonic Analysis of Alternating Current Wave Form. (With E. G. GALLAGHER.)

WALTER AUGUSTUS MOULTON (III.), *Dorchester.* The Precipitation of Gold, Silver, and Copper from Cyanide Solutions by means of Zinc.

NEWITT JACKSON NEALL (VI.), *Philadelphia, Pa.* An Apparatus for the Stroboscopic Study of the Alternating Current Arc. (With M. SILVERMAN.)

EDWARD NORTH, 2d (III.), *Brookline.* A Study of Lead and of Gold Amalgams.

HARRY EDMUND OSGOOD (II.), *Chicago, Ill.* An Investigation of the Action of an Air Lift Pump. (With E. H. PITCHER.)

ISAAC OSGOOD (II.), *West Newton.* The Application and Test of a Condenser as applied to a Wool Drying Machine.

HORACE WHITCOMB OXNARD (I.), *Norway, Me.* Experiments on the Practicability of Determining the Flow through a Long Pipe Line by Measuring the Loss of Head at a Valve.

JAMES ALFRED PATCH (X.), *Stoneham.* The Extraction of Tannin from Hemlock Bark.

CHARLES EDWARD PAUL (II.), *Belfast, Me.* The Relation between Draught and Temperature in Chimneys.

ARTHUR STEARNS PECK (VIII.), *Wellington.* An Investigation of the Electrical Conductivity of Fused Salts. (With H. M. BROCK.)

THOMAS EDWARD PENARD (VI.), *Paramaribo, Dutch Guiana.* An Investigation of Resonance in Alternating Current Circuits. (With C. H. HAPGOOD.)

THOMAS DOANE PERRY, A.B. (II.), *Crete, Neb.* Some Experiments on a Shaft Governor. (With R. G. BURNHAM.)

WILLIAM GARDNER PIGEON (IV.), *East Boston.* A Design for a City Hall for a Small City.

EDMUND HENRY PITCHER (II.), *Keene, N.H.* An Investigation of the Action of an Air Lift Pump. (With H. E. OSGOOD.)

HOWARD CLARK PLUMMER (III.), *Milton.* The Milling of a Nova Scotia Gold Ore with Special Reference to Chlorination and Cyaniding. (With F. W. LITTLEFIELD.)

JOHN LEWIS PORTER (XI.), *North Adams.* A Design for a System of Sewerage and Sewage Disposal for the Town of Randolph, Mass. (With F. W. WITHERELL.)

PAUL LEON PRICE, Ph.M. (IV.), *Winterset, Ia.* A Study of the Construction of an Art Museum designed by Mr. G. B. Ford; including Walls, Foundations, Steel Framing, Heating, and Ventilation. (With C. H. STRATTON.)

WILLIAM PROUDMAN RAND (IV.), *Peabody.* A Structural Design for a Public Library.

WALTER LOUIS RAPP (IV.), *Cincinnati, Ohio.* A Design for a Governor's Mansion.

ARVILLE C. REDMAN (I.), *Belfast, Me.* An Investigation of the Power to be obtained at a Tide Mill near Boston. (With C. A. RICHARDSON.)

ARTHUR ADAMS REIMER (I.), *East Orange, N.J.* A Study of the Tides in Boston Harbor and the Charles River.

CHESTER AUGUSTUS RICHARDSON (I.), *Pelham, N.H.* An Investigation of the Power to be obtained at a Tide Mill near Boston. (With A. C. REDMAN.)

PHILIP FRANKLIN RIPLEY, A.B. (V.), *Andover.* The Electrolysis of Pimelic Acid.

ROBERT PARKER ROBERTS (III.), *Roxbury.* Decomposition of Zinc Sulphate by Heat. (With W. A. DOREY.)

RALPH ROOT (III.), *East Orange, N.J.* The Smelting of a Copper Ore.

GEORGE EDMOND RUSSELL (I.), *Woburn.* A Design for a Steel Dam.

WARREN WILLARD SANDERS (V.), *West Gardner.* An Application of the Friedel-Crafts Reaction.

ALBERT GEORGE ANTON SCHMIDT (II.), *Chicago, Ill.* A Design for an Ice-making Plant.

GEORGE OTTO SCHNELLER (II.), *Ansonia, Conn.* The Relative Efficiency of Bearings and Lubricants of a Spinning Frame under Mill Conditions. (With S. P. BROWN.)

LEWEN FIRTH SEARLE (I.), *Lawrence.* Experiments on the Flow of Water through a Standard Mouthpiece. (With H. M. HARPS.)

KENNETH SEAVER (I.), *Woodstock, Vt.* A Study of Dredging Machines.

HARRY TILTON SHAPLEY (X.), *Leominster.* The Sizing of Cotton Yarns. (With C. H. BROWN.)

CHARLES EDWIN SHERMAN (IV.), *Westerly, R.I.* A Design for a Summer Villa.

LOUIS WILLIAM SHUMAKER (VI.), *Ortonville, Minn.* A Study of an Electrically Propelled Vehicle. (With W. R. COLLIER.)

MORTIMER SILVERMAN (VI.), *Allegheny, Pa.* An Apparatus for the Stroboscopic Study of the Alternating Current Arc. (With N. J. NEALL.)

ROBERT COFFIN SIMPSON (XIII.), *Chelsea.* A Collection and Reduction of Data for the Powering of Ships. (With H. R. HUNT.)

CHARLES EDWARD SMITH (I.), *Somerville.* An Investigation of the Forces Acting on a Water-pipe at Curves and Dead-ends, and of the Methods of Resisting them.

LAWRENCE SOUTHWICK SMITH (II.), *Peabody.* The Effect of Different Initial Pressures on Explosive Mixtures of Gas and Air. (With S. M. MANLEY.)

FREDERICK WILLIS SNOW (III.), *Lynn.* Concentration of Low-grade Pyritic Ore from Eustis, Can. (With R. H. LEACH.)

FREDERIC WILLARD SOUTHWORTH (IV.), *West Stoughton.* A Bank Building for a City of 600,000 Inhabitants.

MARCY LEAVENWORTH SPERRY (II.), *Brooklyn, N.Y.* The Efficiency of the Hancock Water Ejector. (With P. R. ZIEGLER.)

HERBERT RICHARDSON STEARNS (I.), *Dorchester.* An Investigation to determine the Accuracy that may be attained with the Pitot Tube in the Measurement of the Flow of Water through Pipes. (With C. D. THURBER.)

WILLIAM LEONARD STEVENS (III.), *Somerville.* The Milling of a Nova Scotia Gold Ore, with Special Reference to Concentration. (With L. EMERY, 3d.)

LEWIS STEWART (IV.), *Trenton, N.J.* A Design for a City Residence.

WILLARD WILBERFORCE STONE (I.), *Taunton.* A Study of Inverted Siphons as used in Sewerage Works, with a Design for a Special Case.

CHARLES HEYWOOD STRATTON (IV.), *Springfield.* A Study of the Construction of an Art Museum designed by Mr. G. B. Ford; including Walls, Foundations, Steel Framing, Heating, and Ventilation. (With P. L. PRICE.)

CARL FREDERICK SUHR (II.), *Chelsea.* A Study of the Coefficient

of Friction at Different Speeds, between Leather Belting and Cast Iron. (With F. N. HORTON.)

HENRY HOWARD SULLIVAN (II.), *Brighton.* A Study of the "Slip" and "Creep" of Leather Belting.

RUSSELL SUTER (I.), *Cambridge.* Design for a Chanoine Wicket Dam.

HARRY MARTIN THAYER (V.), *Brockton.* The Recovery of Zinc from Pyrite Residues.

CLINTON DRAPER THURBER (I.), *Attleboro.* An Investigation to determine the Accuracy that may be attained with the Pitot Tube in the Measurement of the Flow of Water through Pipes. (With H. R. STEARNS.)

PERCIVAL EDWARD TRUE (X.), *Andover.* The Electrolysis of Sodium Chloride Solutions.

THEODORE CALVIN TUCK (I.), *Haverhill.* Design for a Cantilever Highway Bridge.

WARREN CHAMBERLAIN TUDBURY (I.), *Salem.* A Plan for the Abolition of Grade Crossings on the Boston & Maine Railroad at Everett, Mass. (With M. E. BROOKS.)

GEORGE AUGUSTUS TWEEDY (III.), *Downey, Cal.* A Study of Fine Concentration. (With R. H. CLARY.)

EMIL FREDERICK VOGEL (I.), *Roxbury.* A Design for a Lift Drawbridge.

HARRY LESLIE WALKER, (IV.), *Oak Park, Ill.* A Design for a Modern Office Building.

ARTHUR CLARENCE WALWORTH, JR. (II.), *Newton Centre.* An Investigation of the Friction of Steam in Elbows and Bends.

FRANK DINSMORE WARREN (II.), *Northboro.* The Influence of Moisture on the Transverse Strength of Spruce Timber. With D. E. MAXFIELD.)

RICHARD WASTCOAT (I.), *Taunton.* An Investigation of the Effect of Air in Water Mains.

WILLIAM HENRY WEDLOCK (I.), *Dorchester.* Design of a 200-foot Cantilever Crane.

IRVING CHAMBERS WEEKS (IX.), *Dorchester.* Trade with France and the Reciprocity Treaty of 1899.

ARTHUR BURR WHITE (I.), *Allston.* Design of a Ferry Landing Bridge.

WALTER CUMMINGS WHITNEY (I.), *Newton.* Design of a Curved Chord Railroad Bridge, 300 Feet in Span, to be erected without False Work.

FREDERICK WHITEFIELD WITHERELL (XI.), *Winchester.* A Design for a System of Sewerage and Sewage Disposal for the Town of Randolph, Mass. (With J. L. PORTER.)

WILLIAM ISAAC WYMAN (XIII.), *Dorchester.* The Design of a Mathematical Ship-shaped Solid and the Application thereto of Certain Rules used in Ship Calculations. (With G. B. MOODY.)

PERCY ROLFE ZIEGLER (II.), *Roxbury.* The Efficiency of the Hancock Water Ejector. (With M. L. SPERRY.)

CANDIDATES AWARDED THE DEGREE OF BACHELOR OF SCIENCE DURING THE YEAR 1899–1900

RUSSELL GILPIN (II.), *Wilmington, Del.* Design of a Brake Shoe Testing Machine.

ARTHUR LITTLE HAMILTON (III.), *Fond du Lac, Wis.* Precipitation of Gold from its Chloride Solution in the Presence of Impurities.

EDWARD HERBERT (VI.), *Broad Run, Va.* Test of a Single Phase Induction Motor.

OWEN LEWIS LEONARD (V.), *Newton Centre.* An Investigation of the Action of the Various Assistants used when Mordanting Wool with Bichromate of Potassium.

ALBERT FRANKLIN NATHAN, JR. (X.), *Kansas City, Mo.* The Absorption of Oxygen by Sterling Silver.

EDITORIALS

By coming to Boston during Commencement Week, by accepting the invitation of the Technology Club to be its guest, and by entering with delightful zest into all that concerned the Institute, Dr. Pritchett has indeed been graduated, as he gracefully expressed it, with the class of 1900, and will be formally inaugurated, on the 24th of next October, not as a stranger, but as one of ourselves. The felicitous introduction of the President-elect to the alumni by President Crafts, and Dr. Pritchett's happily worded appeal for their personal friendship, secured that friendship at once and for all time. His manliness, his heartiness, his tact, his genuine interest in every Institute man and every Institute matter brought before him, confirm the highest expectations of his friends, and fully justify the lamentations of those in Washington who must lose in order that the Institute may gain.

Graduation Day was so unwontedly cool that the simple and dry exercises attending the giving of degrees were less of a tax upon the participants than usual. But, even though favored by the weather and buoyed up by the President's admirable address, it is idle to maintain that the audience was not, as always, bored by the abstracts of theses read; and to be bored is to gain a bad impression. Would it not be wiser to leave a good impression by sparing these ten or more graduates the agony of trying to make the unintelligible interesting, and to ask some man of national reputation to speak in their stead? Then, not only would the audience be no longer wearied, but the graduating class would carry away, in addition to its diplomas, in addition to the affectionate and appreciative words of the President, thoughts, experiences, and inspiration from a new point of view, from that of a man who has reached the top of the stiff hill which they are about to climb, who has "got there," as the slang phrase is, by reason of some

quality of mind and character which cannot but give to his words, especially at so momentous a time, a peculiar weight and power. Such an address at such an hour could scarcely fail of infinite value to a large number of those who hear it.

The well-executed leading article of this year's *Technique*, on Professor Runkle, startles one anew with its ocular reminders of the growth of the Institute. To the students of to-day these revived pictures of the "sand lot," where is now the Walker Building, look as queer as do the costumes of the men and women figuring so prominently in the picture of the old Mercantile Association Building,— the first home of the Institute,— which *Technique* also reproduces. Boylston Street, with its jostling crowds and its settled air of retail shoppery, to-day would tolerate neither the hoop skirts of 1865 nor the sand lots of 1880.

But those were snug and simple times, when the whole Massachusetts Institute of Technology was to be found within the Rogers Building and its contiguous dump, adorned with that historic pile, the "Gym."; with the long-obliterated, one-story "Mechanic Arts" Building (in one end of which, as in a sort of quarantine, were isolated the women students); and with some huge rock specimens, around which meandered a path to suggest to the indulgent eye a sunken garden. Within the Rogers Building itself, of those days, one had but to throw open a door here, and the whole Architectural Department was before him; a door there, and the Civil Engineering Department was comprehended in a sweep of the eye; while by going down a broad stairway, by means of which the man who must now drop himself through a spiral knot-hole could then descend in dignity to the basement, one saw before him, *in toto*, the departments of Chemistry, of Mining, of Metallurgy, and the laboratory of Mechanical Engineering. It is true that, to see the latter, which consisted of one small steam-engine, it was necessary to light a lantern; for this single piece of apparatus had been placed

in the darkest of the many dark passages. What an expansion of the whole college is signified by the fact that the Mechanical Engineering Laboratories alone now cover a floor space of nearly half an acre!

Jones's restaurant was a feature, now long forgotten, of that primitive day. Jones occupied a sort of loft in the Gymnasium, a loft which, rising out of the "sunken garden" to the true ground-level, was reached by a drawbridge flung from Newbury Street. This was a very Bridge of Sighs to the hungry student, to whom no alternatives to Jones were possible, save a cold lunch brought from home or a distant down-town restaurant. For the bridge led one past the Jones kitchen, fully open to the gaze, and wherein such culinary outrages were committed as to appall the appetite of even a growing youth. From Jones's to Mrs. King's and the Technology Club is an advance no less great than from the lantern-lighted Dixwell engine to the magnificent Mechanical Engineering Laboratories of to-day.

It seemed a formidable and doubtful step forward when the Gymnasium was sent to Exeter Street, the shops to Garrison Street, and the "New" (afterward named the Walker) Building was erected upon their site. Yet sixteen years thereafter it has been found necessary to put up three more "new" buildings and to purchase land covering nearly the whole square bounded by Clarendon Street, Trinity Place, St. James Avenue, and Stanhope Street. This recent purchase of land, which practically doubles the holdings of the Institute upon what now might be called the Clarendon Street campus,— distinguishing it from the Boylston Street campus,— settles for many years to come the question of removal. Tire as one may of the noise and restricted space of the city, and dream as one may of "glory-crowned heights," as at Columbia, or of academic groves, as at Harvard, a location in the heart of a city for a college — especially for a college of pure and applied science — has many real advantages.

For such a location means accessibility to the vast and ever-increasing circle of suburban homes, brought each year closer to the city's heart, whence students may come to such a college without breaking away, as so many young men cannot, from the family life and interests. It means nearness to libraries, museums, and other re-enforcements of education which are possible only in a city. It means closeness of touch with the great mercantile and manufacturing forces, which are depending more and more for their vitality upon educated men, and upon which the college must ever rely for financial backing as well as for objective stimulus to the work and self-denial of a real education. But, more than all these things, the city habitat for the college keeps that institution quickened, maintains its young men in a healthful atmosphere of work and striving, holds constantly before them high standards of achievement, preserves them from that academic super-saturation which renders the air of the small college town sometimes almost poisonous. All this may savor of materialism; but, of the two alternatives, far better for any young man that he be turned toward hustling usefulness rather than toward cloistral superciliousness.

Not that the latter state of mind is inseparable from the isolated college planted in a community which wholly loses its identity in that of the institution it shelters, forcing the college to develop in an artificial atmosphere, much after the fashion of a young man who should be reared within the circle of an admiring family, wholly shielded from the hard knocks and frank criticism of that unsympathetic world in which, sooner or later, he must make his way. But the chances are that the higher education, which above all things should be typical of the nation and a leader of the nation, will be a more vital and useful force if it be kept closely within, and at the same time above, the most typical, progressive, and stimulating atmosphere of to-day,— that of our great cities.

As to the moral danger of the city to young men, that is a fallacy which experience and statistics, as well as sound reasoning, unite

to disprove. Temptations to evil exist everywhere, even in the remotest hamlet; and it is only an Arcadian self-deception to pretend that the country is freer from them than the city. To remove temptation by retreating to the wilderness and ringing a curfew bell is to hide one's head, like an ostrich, fatuously believing that Satan cannot see one. To escape from the possibility of viciousness is absolutely impossible. The weak youth will find vice, and succumb to it, just as quickly in the country as in the city; in many cases more quickly, for he will have less to claim his interest, and will find no excitement — which it is natural for youth to crave — except in the breaking of college rules and moral laws. In the city, on the contrary, with its thousand varied interests and its many legitimate excitements, with courses, too, like those of the Institute, demanding of a young man steady daily application and a wide range of independent thought and action, the chances for moral mischief are reduced to a minimum. It is but natural, therefore, that the general moral tone of the Institute students — despite the fact that they have no proctors but their own consciences — should be exceptionally high.

A boarding-house life, however, is not an ideal one for a young man. Even though he avoid the mistaken economy of a cold hall bedroom and cheap, poor food, the aims of such a community of "transients" are not high, the friends he makes there are not, as a rule, of the best and most permanent kind, the social development of the youth, which is to play so important a part in his future career, is not there properly provided for. Therefore, it would seem wise that young men coming from a distance should either establish themselves in some suburban town, into whose social life they could readily enter, or should group themselves together, securing thereby the best living for the least money, making certain of a congenial companionship among themselves, and obtaining the social advantage of a much wider circle of friends. Here would seem to be a good field for alumni effort in helping to establish, to maintain, and indirectly to govern student houses, where the young men themselves should exercise censorship over

the house, and should regulate its economy. In this way the undergraduates would obtain, under the most agreeable conditions, not only a higher social life, but also a most valuable training in self-government and domestic management.

GENERAL INSTITUTE NEWS

Again the Institute year has closed with its graduation exercises, succeeding the usual two weeks' period of examinations. The conditions of weather were exceptionally favorable; and the reception of President Crafts, assisted by president-elect Pritchett and Mrs. Rogers, was notably successful.

The number of graduates is 178, distributed as follows among the courses: civil engineering, 31; mechanical engineering, 33; mining engineering and metallurgy, 20; architecture, 21; chemistry, 16; electrical engineering, 22; biology, 3; physics, 3; general studies, 5; chemical engineering, 11; sanitary engineering, 4; naval architecture, 9. In addition, five candidates are mentioned in the programme as having received degrees during the year; and twelve persons received the diploma of the Lowell School of Design.

CORPORATION NOTES

On Friday, June 22, Mr. Augustus Lowell, for twenty-seven years a member of the Corporation and for seventeen years of its Executive Committee, died at his home in Brookline. Mr. Lowell has been one of the most active and valuable members of the Corporation, and has helped the work of the Institute in many ways. An extended notice of him will appear in the October number of the REVIEW.

The 282d meeting of the Corporation was held at the Institute, April 18, 1900, to authorize the purchase of land, in pursuance of negotiations between the Executive Committee and the officers of the Boston and Providence Railroad. It was a source

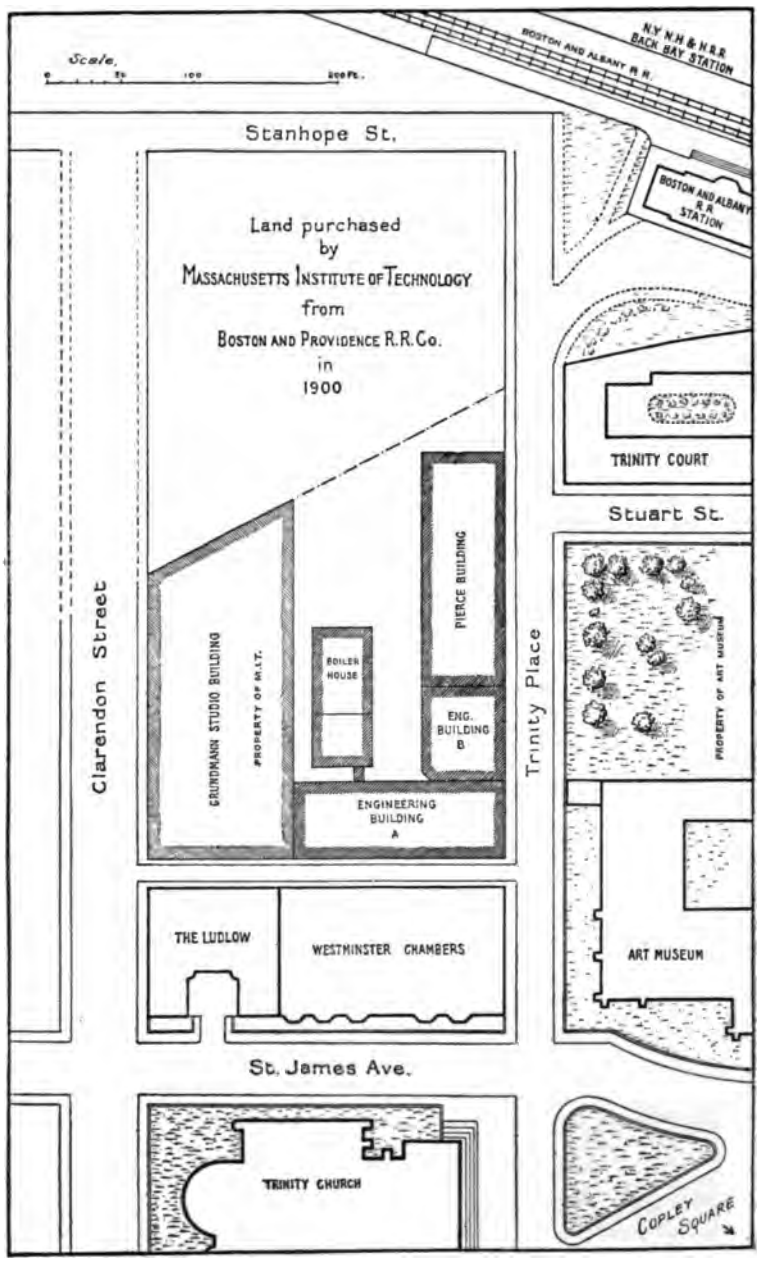
of much gratification to the Institute that it was able to secure land so eligible for future needs. While the reduction of income-bearing funds is regrettable, the opportunity was one which could not be sacrificed. A plan of the new land is given on the opposite page.

FACULTY NOTES

The annual meeting of the Faculty for the election of Standing Committees and Secretary was held on Monday, May 7. The Committee on Excuses from Drill becomes, with additional members, a Committee on Military Instruction.

Besides minor changes in the courses in civil and sanitary engineering and biology, important changes have been made in several of the other courses. Detailed schedules have been adopted of the new option in heating and ventilation (of Course II.) and landscape architecture (of Course IV.). A series of five options is offered in the course in chemistry, one including the elements of mechanism, one a considerable proportion of physics, the others following more nearly the present option. On the other hand, a new option in electro-chemistry has been introduced in the course in physics. These changes have led to a supplement to the circular on chemistry and chemical engineering, and to the preparation of a new circular on the department of architecture.

A complimentary dinner in honor of President Crafts, given by the Faculty, took place at the Technology Club on the evening of May 17, no less than forty-five members of the Faculty being present. After the dinner had been served, Dr. Runkle made a brief address, preliminary to his calling upon President Crafts, who responded in his wonted happy vein, which lacked not of the peculiar and delightful quality of wit of which he seems to have a monopoly. One of the most permanent and agreeable impressions to be left by his administration, he said, was the appreciation he felt of the opportunity it had given him for personal acquaintance and friendship with the members of the Faculty,—a sentiment which surely found full sympathy and response in the feelings of his hearers. The evening was an exceptionally pleasant one, largely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THE LUDLOW
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TRINITY CHURCH
COPLEY SQUARE

from the fact that all were conscious that they were parting from their guest in no sense except in his official capacity.

ENTRANCE EXAMINATIONS

Entrance examinations for 1900 were held June 28, 29, and 30 in the following places as well as at the Institute: Belmont, Cal.; Binghamton, N.Y.; Buffalo, N.Y.; Chicago, Ill.; Cincinnati, Ohio; Cleveland, Ohio; Concord, N.H.; Denver, Colo.; Detroit, Mich.; Exeter, N.H.; Göttingen, Germany; Indianapolis, Ind.; Kansas City, Mo.; Louisville, Ky.; Manlius, N.Y.; New York, N.Y.; Philadelphia, Pa.; Pittsburg, Pa.; Portland, Me.; Pottstown, Pa.; Poughkeepsie, N.Y.; St. Louis, Mo.; Spokane, Wash.; Springfield, Mass.; Washington, D.C. Binghamton and Spokane are new points.

The total number of applicants is as follows: complete, 232; preliminary, 244; final, 189. Last year the corresponding numbers were: 217; 260; 152.

SUMMER COURSES

Summer courses, under the direction of members of the instructing staff of the Institute, have been offered in the following subjects for the summer of 1900: —

I. Mechanical Drawing and Descriptive Geometry.
II. Mathematics: Analytic Geometry; Solid Geometry.
III. English Composition.
IV. Chemistry: (*a*) General and Analytical Chemistry; (*b*) Inorganic Chemistry for Teachers; (*c*) Organic Analysis, Reactions, and Preparations; (*d*) Organic Chemistry for Teachers; (*e*) Water Analysis and Air Analysis.
V. Physics: (*a*) Mechanics, Light, and Electricity; (*b*) Heat; (*c*) Physical Laboratory; (*d*) Electrical Testing.
VI. Modern Languages: (*a*) French; (*b*) German.
VII. Shop-work: (*a*) Woodwork; (*b*) Forging; (*c*) Chipping and Filing; (*d*) Machine-tool Work.
VIII. Surveying.
IX. (*a*) Mechanism; (*b*) Mechanical Engineering Drawing.
X. Architecture: (*a*) Shades and Shadows; (*b*) Elementary Design.
XI. Geology: (*a*) Mineralogy; (*b*) Blowpipe Analysis.

PROFESSIONAL SUMMER SCHOOLS

The Summer School in Civil Engineering this year has been held at Lake Sunapee, N.H., and has included topographical surveying, hydraulic measurements, and field work in geology. The base line has been measured by means of a steel tape, and the position of certain points has been established by triangulation. The work also included the hydrographical survey of Lake Sunapee. The work in hydraulics consisted in measuring the stream by several methods and gauging meters.

The Summer School of Architecture has been conducted by Professor Homer. Excursions have been made from Boston to Providence, R.I., and to Newburyport, Ipswich, and Cambridge. A week was spent in Providence, where the Rhode Island School of Design gave the use of one of its rooms to the summer school while there; and numerous photographs were taken. Measured drawings were made of colonial architecture.

The Summer School in Mining this year is conducted by Professor Richards, who left Boston on June 8 to visit Dover, N.J., where a study of the methods of mining, hoisting, treating, and shipping the ore was made. A trip was also made to Edison, N.J., where the Edison magnetic plant for separating iron ore was inspected. From Dover the party went to Pottsville, Pa., where a visit to the coal mines was made. It then went to Bethlehem, Pa., where the students had an opportunity of observing the whole process of iron-working from the mining of the ore to the turning out of the finished product at the Bessemer plant and the armor-plate and gun shops. A study was made of the Hokendaqua iron mines, and of the use of the washer as a method of concentration. The other methods of concentrating and smelting iron and zinc ores were studied.

On May 5 the Paris Salon of 1900 awarded the first medal to Mr. Désiré Despradelle, professor of architecture in the Institute. The subject of Professor Despradelle's design is a monument "dedicated to the glory of the American nation," and

is said to be of a grandeur of conception and of a daring in execution almost unparalleled.

Its title, "The Beacon of Progress," indicates the character of the composition, the height of which is designed to be 1,500 feet. The artistic presentation of the project received the unanimous approbation of the jury the day of its admission to the Salon, and the award of the first medal crowns a labor of almost six years.

The awards of the Salon for the section of architecture are two medals of the first class, four medals of the second class, six medals of the third class, and an unlimited number of mentions.

Professor Despradelle received first promotion at the École des Beaux-Arts in 1882; received many of the prizes at the École des Beaux-Arts and Société Centrale des Architectes Français; took part in the Concours de Rome four times, and received first second *grand prix* in 1889, being designated *lauréat du Salon*, *officier d'Académie*, assistant inspector of State buildings and national palaces, and under this title helped in the building of the new ministry of agriculture, the national library, the mansions of M. Wilson and M. Grévy, the ex-President, and various other public and private buildings in Paris.

Extract from a letter from H. W. Gardner, '94, dated Paris, June 10, 1900:—

About all the "Fair" I have seen has been the Fine Arts Building and our exhibit in the Educational Department, which I hunted up yesterday. It's the swellest exhibition that the department ever sent out; and I know that, when you see it, you will agree with me that at the end of the Exposition it ought to be boxed up and sent home just as it is, frames and all, *regardless* of expense. The location is excellent,— in one of the principal corridors of the gallery, where everybody can see it without any effort, and not in the exhibit proper, which has a room to itself, and into which the people are not apt to go unless particularly interested. It seems to be the only exhibit of a department of architecture from our side of the water, and it's just as well that the others didn't attempt to send any.

Professor George F. Swain, '77, and Professor C. F. A. Currier have appointment as judges for the Hall of Fame, New York University. The whole number of judges is to be one hundred.

At the New England Railroad Club, May 9, two lectures were given, one by J. W. Rollins, '78, on "Arch Construction," and one by Louis Derr, '92, on "Tests of Colored Glass for Signals." Both lectures were illustrated with the stereopticon.

The following letter is taken from the Springfield *Republican* of May 24: —

My attention has been called to a statement in your issue of the 11th instant, from your special reporter in Boston, under the head "Hard to find Employment," in which he refers to "a well-educated and competent graduate of the Institute of Technology, who is a civil engineer by training, who is to-day selling baking-powder in lack of anything better to do." Possibly, this may not have referred to the Massachusetts Institute of Technology; but, in case it did, I beg leave to ask if you will inform me confidentially who the young man is to whom reference was made. I find by turning to my memorandum-book that since last December I have received between fifty and sixty applications for men, most of whom I have been unable to fill, as I know of no graduates whom I can recommend who are unemployed. If the statement of your correspondence is true, then one of two things is also true: either the young man in question prefers to sell baking-powder rather than to follow his profession, and does not let me know that he desires engineering employment, or else he is not a man in whom I feel sufficient confidence to be able to recommend him to the positions which have offered.

The fact is that there never was a better opportunity in civil engineering work than there is to-day. A good man is certain to find employment, and to be able to make a place for himself; but it is true to-day, as it always has been, that there are few places for poor men. Many a man is dear at any salary in engineering work, and a single mistake may cost his employers more than his entire wages for a year. Men of this kind, in justice to themselves, should not attempt to enter this profession; but there is great need and great opportunity for able, bright young men with an aptitude for engineering. There are graduating from my department every year some thirty young men. These obtain employment without difficulty, and I could doubtless find positions for double as many each year.

GEORGE F. SWAIN.

BOSTON, May 21, 1900.

NOTE. — It has since been learned that the "well-educated and competent graduate" never attended the Institute, and that he earns a large salary by his present labor.

At its recent meeting in New York, Professor Charles Sedgwick Minot, LL.D., '72, was elected president of the American Association for the Advancement of Science. A summary of Dr. Minot's distinguished career will be found in the TECHNOLOGY REVIEW for October, 1899 (Vol. I. p. 463).

On June 27 Dr. Henry S. Pritchett, together with the Secretary of War, received the degree of LL.D. from Hamilton College.

SOCIETY OF ARTS

The following papers have been read at the regular meetings of the Society of Arts, January to May, 1900: —

"A New Dynamo Static Machine," by Professor Elihu Thomson; "An Architect's Tour through the Riviera and Central France," by Professor E. B. Homer; "Massachusetts Roads, Old and New," by Mr. W. E. McClintock; "Water Storage on the Gila River, Arizona," by Mr. F. H. Newell; "The Boston Elevated Railway System," by General W. A. Bancroft; "Recent Changes of Opinion in England in Favor of the Bacteriol Purification of Sewage," by Professor L. P. Kinnicutt; "Lecture-room Models for Illustrating the Modern Methods of Electric Transmission of Power," by Professor W. L. Puffer; "Steel, Gray, and Gun Iron Castings, their Uses and Relative Advantages," by Professor W. W. Bird.

At the annual meeting on May 10 the following Executive Committee was chosen to serve from October, 1900, to 1901: George W. Blodgett, Edmund H. Hewins, Desmond Fitzgerald, Charles T. Main, and James P. Munroe. Dr. George V. Wendell was re-elected secretary.

THE UNDERGRADUATES

"THE MEDICINE MAN"

On the afternoon of Friday, April 6, the students presented a very ambitious and successful comic opera, "The Medicine Man," at the Hollis Street Theatre, the proceeds going to the support of the Athletic Association. The programme was as follows: —

Libretto by Samuel Merwin Music by Clarence Dickinson

Mushash, Chief of the Wallahoos . . . . . James Driscoll, '02
Monne Chow-chow, his Medicine Man . Richard Baker Derby, '01
Owandah, a Young Brave . . . Matthew Chauncey Brush, '01
Peter Simpkins, a Yankee Pedler . . . . Charles Van Merrick, '00
Totem of the Wallahoos . . . . . Allan Winter Rowe, '01
The Property Man . . . . . Frederick R. C. Boyd, '01
Clover, a Spinster with Hopes . . . . . Lewis Emery, 3d, '00
Naunee, Daughter of Mushash . . . John Randolph Brownell, '00

The Scene is the Camping-grounds of the Wallahoos

The time is when you like

BALLET OF BROWNIES AND FAIRIES

Mortimer Bristol Foster, '01; Paul Hansen, '02; Robert Rishworth Jordan, '03; John Russell Morse, '01; William H. Haskell Moies, '03; Hiram Fred Peaslee, '03; Maurice Goldenburg, '02; and Oliver Porter Scudder, '03.

GHOST DANCE

Milton Weston Hall, '00; Charles Galloupe Mixter, '02; William Jason Mixter, '02; James Lockerman Taylor, Jr., '02; Francis Blair Driscoll, '01; Arthur Gunderson Hayden, '01; Charles Emmet McCarthy, '02; and Roland Ball Pendergast, '02.

SOLO DANCES

Lewis Emery, 3d, '00; and Allan Winter Rowe, '01.

PAS À DEUX

Mortimer Bristol Foster, '01 ; and Paul Hansen, '02.

CORPS DE BALLET

Leslie Walker Miller, '01 ; John Frederick McGann, '01 ; Edmond Francis Brigham, '00 ; Harold Arthur Everett, '02 ; Williard Vaughan Morse, '02 ; Lawrence Hargreave Lee, '03 ; Herbert Milton MacMaster, '00 ; Edwin Francis Albright, '03 ; Walter Philip Regestein, '03 ; Ralph Stoodley Loring, '01 ; Elmer Merrill Hervey, '02 ; Guy Crosby Peterson, '01 ; Anthony Winfred Peters, '01 ; Charles Augustus Barton, Jr., '00 ; James Edmund Barker, '00 ; James Finton Doran, '03 ; George Babcock Wood, '03 ; Andrew Elliot Ritchie, '01 ; George William Bateman, '03 ; Philip Wyatt Moore, '01 ; Charles Ozro Egerton, '03 ; Gyula Bennett Mason, '03 ; Stanley Alfred Foster, '03 ; and William Whipple, '01.

CHORUS : BRAVES

F. N. Fowler, '02 ; I. C. Weeks, '00 ; S. L. Wonson, '02 ; W. C. Appleton, '01 ; J. B. Finnigan, '03 ; G. F. Loughlin, '03 ; A. S. Martin, '03 ; M. Brodie, '02 ; W. F. Davidson, '01 ; W. N. Brown, '02 ; H. W. Maxson, '01 ; R. W. Eaton, '03 ; L. B. Gould, '03 ; E. F. Church, Jr., '01 ; P. L. Crittenden, '01 ; A. P. Hall, '02 ; W. Wellman, '02 ; G. R. Gaenslen, '03 ; H. H. Howe, '00 ; H. W. M. Storer, '03 ; A. Gardner, '02 ; G. H. Gleason, '03 ; R. B. Williams, '03 ; C. H. Boardman, Jr., '02 ; A. F. Bennett, '03 ; and F. W. Witherell, '00.

SQUAWS

J. R. Marvin, '02 ; H. H. Sullivan, '00 ; A. P. Baker, '03 : W. M. Drury, '03 ; G. F. Ashley, '00 ; E. L. Upham, '02 ; H. G. Harris, '03 ; C. Boardman, '02 ; N. E. Borden, '02 ; J. S. Bronson, '01 ; P. R. Brooks, '00 ; and F. W. McIntyre, '01.

The show was given under the following management : —

Milton Weston Hall, '00, business manager ; Allan Winter Rowe, '01, director of stage arrangements ; Ray Murray, '01, ticket agent ; Henry Hodgman Saylor, '02, assistant business manager ; James Bradford Laws, '01, assistant director of stage arrangements ; and Charles Walter Corbett, Jr., '01, press agent.

The patrons and patronesses were : —

Mrs. Roger Wolcott, Mrs. Julia Ward Howe, Professor John D. Runkle, Mrs. Louise Chandler Moulton, Professor and Mrs. Charles R. Cross, Mrs. Oliver Ames, Professor and Mrs. Henry P. Talbot, Mr. and Mrs. J. Montgomery Sears, Professor and Mrs. William T. Sedgwick, Mr. and Mrs. W. F. Apthorp, Mr. and Mrs. Henry Austin Clapp, Professor and Mrs. Francis W. Chandler, Dr. and Mrs. John P. Sutherland, Mr. and Mrs. Frederick P. Vinton, Professor and Mrs. William H. Niles, Dr. and Mrs. Samuel J. Mixter, Professor Arlo Bates, Mr. and Mrs. C. P. Curtis, Dr. and Mrs. D. W. Cheever, Professor and Mrs. Gaetano Lanza, Mr. and Mrs. Samuel Cabot, Professor and Mrs. George F. Swain, Professor and Mrs. Dwight Porter, Mr. F. J. Stimson, Mr. Amory A. Lawrence, Mr. and Mrs. W. B. Kehew, Mr. Alfred Hemenway, Mr. Charles Follen Adams, Mr. and Mrs. H. Staples Potter, Mr. and Mrs. A. Lawrence Rotch, Mr. and Mrs. Arthur Foote, and Professor and Mrs. Désiré Despradelle.

The performers were coached by Mrs. Janet Edmondson-Walker. The music was directed by Mr. John Mullaly, and the dancers were trained by Mr. John Coleman. Altogether the performance was not only more elaborate, but, on the whole, more successful than the Minstrel Show of 1899. The dancing was particularly fine; and the acting and singing, while uneven, as is always the case with amateurs, was fully equal to that of other college performances.

JUNIOR WEEK

The week of April 23 was enlivened for the undergraduates, and particularly for the members of 1901, by an unusually successful round of Junior Week festivities. The Spring Concert of the Musical Clubs on Tuesday, the Walker Club play on Wednesday, and the Junior Prom. on Thursday evening were, as usual, the main features of the week, supplemented by receptions and spreads on several afternoons. Most important of all, to the mass of the undergraduates, was the appearance, at noon on Wednesday, of the 1901 *Technique*, which achieved an instantaneous success, due in particular to the graceful and witty verses with which it was embellished.

The first important event of Junior Week, the Spring Concert,

was held, as has been the custom for several years past, at Paul Revere Hall. The audience was large; and the greeting extended to the Glee Club, which organization opened the entertainment with a careful rendering of "From a Bygone Day," was an enthusiastic one. The Banjo Club played "A Warm Reception" in a spirited manner, and Mr. H. K. Hooker made one of the hits of the evening with an excellent tenor solo. The Mandolin Club played Henselt's "Liebeslied" with good technique, and added "The Ameer March" as an encore. Messrs. J. A. Patch, C. E. Patch, Whittemore, and Hooker sang "Wake not, but hear me, Love," and "Just a Song at Twilight," arousing considerable enthusiasm; and the Banjo Club ended the first part of the programme with "The Pixie Dance." After the intermission the Mandolin Club rendered the "Infanta Patrol" with grace and delicacy. Messrs. Foster and Boyd played a duet, with "'Rastus on Parade" as an encore, amid much applause. The greatest enthusiasm, however, was reserved for Mr. C. Van Merrick and the Glee Club in the topical song "Predicaments," which dealt with some of the humors of the Institute with marked success. "Elegia," the next selection by the Mandolin Club, was played with skill and real artistic feeling; and the last number on the programme was an original Technology song, the words by Clarence Renshaw, '99, the music by Lloyd B. Harworth.

This latest attempt to satisfy the perennial need for a characteristic Technology song can hardly be considered a conclusive success. The melody is dignified and impressive, but lacks the vigor, the swing, the catchiness which a college song must possess. If only the rollicking verses which Gelett Burgess contributed to the 1901 *Technique* could be set to music which embodied their spirit, the Technology song question would be nearer solution.

The Walker Club Theatricals on Wednesday evening marked a decided and praiseworthy advance over the efforts of previous years. Many Institute men have felt for some time that, although the Pinero comedies produced in the past were amusing and capitally done, it would be more fitting for Technology to be ranged with the more important colleges in combining with amusement

something of real literary value. Professor Bates's choice of a play was a very happy one. "The Miser," in the hands of Plautus, of Molière, and of Fielding, has amused the Greek, the Frenchman, and the Englishman for centuries; and the last version of the three is especially suited for a college performance, because its atmosphere is strong enough to hold the imagination and not so remote as to be unattainable. In spite of all this, it must of course be owned that such a classic play, almost devoid of situation, and depending mainly on the actor's portrayal of character, is a much harder task than a modern comedy, full of "fat" lines and startling complications. The actors, therefore, deserve great credit for the success with which they held their audience and kept them in a ripple of laughter during the whole performance. J. T. Scully, Jr., a star of two years' standing in the Technology firmament, gained especial laurels for his rendering of the title-rôle. Lovegold would be an exacting part for a professional, and the simplicity and reserve with which Scully treated it made an artistic background for his stirring climax at the end of the third act. Next perhaps may be mentioned Beckwith as Mariana, one of the most charming girls ever seen on the college stage. His, or her, conception of La Précieuse, with the dainty, formal affectation of that type, was perfect; and professor, alumnus, and undergraduate alike lost their hearts to her. Appleton as Ramilie, the alert and rascally servant, was capital, and showed the comedian's instinct in every pose and gesture. H. H. Howe, too, as Lappet, played with ease and perception, and was enthusiastically approved by the audience. Of the other principals should be mentioned Hepburn, simple and spontaneous as Clermont; Constantine, a somewhat vehement maiden, but a very winsome bride; Tolman as Frederick, Peters as Mistress Wysely, and Morse as Mistress Wheedle. The play went, throughout, without a single hitch, and the country dance at the close was a happy addition to the original. Altogether, the performance was a pledge that, if the Walker Club keeps up its good work on this line, Institute men will excel in the class of college performances of which "Athalie" was a type, as they have already produced one of the best college comic operas ever seen in Boston.

Of the other events of Junior Week there is but little to be said here. The success of the Tech Tea on Friday afternoon, of the Technology Club Reception to the Prom. guests, and of the Prom. itself, was better appreciated by the participants than described by the reviewer. It should be said, however, that the Prom., of which the matrons were Mrs. Hasket Derby, Mrs. S. J. Mixter, Mrs. Alexander S. Porter, Mrs. A. Lawrence Rotch, and Mrs. George F. Swain, was an unusually brilliant affair in spite of the rival attractions of the Artists' Festival in Copley Hall. It proved, altogether, a fitting climax to one of the most notable Junior Weeks in the history of the school.

ANNUAL MEETINGS

At the annual meeting of the Glee Club on April 26 L. B. Haworth, '02, was elected leader, and Claude Patch, '02, was elected manager.

The annual meeting of the Architectural Society was held April 11 in the Pierce Building. The report of the treasurer showed the society to have a balance in the treasury of $102. During the present year there have been thirty-one men admitted to membership. The following officers for the ensuing year were elected: president, E. F. Lawrence, '01; vice-president, F. N. Emerson, '01; secretary, F. W. Puckey, '01; treasurer, J. C. Fruit, '02; Executive Committee, W. T. Aldrich, '01, F. A. Colby, '01, H. T. Blanchard, '01.

At the annual meeting of the M. I. T. Athletic Association on Friday, April 13, the following officers were elected for the coming year: president, Herbert M. MacMaster, '00; vice-president, H. P. MacDonald, '01; treasurer, Charles A. Sawyer, Jr., '02; secretary, Robert V. Brown, '02; manager, Percy H. Parrock, '01; representative to the Advisory Council, Charles W. Corbett, Jr., '01.

ATHLETICS

The Advisory Council recently granted an emblem to the Hare and Hounds Club. The conditions are that, if the club holds at least six runs and a championship run each year, the runs being

over five miles in length, the members who finish within two minutes of the first hound on three-quarters of the runs and the winners of places in the championship run will be allowed to wear a T. H. H. The monogram is to be similar to the T. A. A. now given to winners of firsts in the class and indoor meets. If the club holds a championship run this spring, the winners will be eligible for the emblem.

At the N. E. I. A. A. held at Charles River Park on Monday, May 21, Ray Murray, '01, won the 2-mile bicycle race in 4 m. 36⅘s.

On April 28 Brown defeated Massachusetts Institute of Technology in track sports by 81 to 54 points, the figures by which Tech beat Brown last year.

The meet was a very successful one. Two Brown records were broken, the hammer throw and the discus throw. The stars on the Brown side were Captain David C. Hall and E. S. Tuttle. The latter, though a Senior, appeared on the track for the first time.

In the 120-yard hurdles, Pope was disqualified for throwing a hurdle. A protest was made by M. I. T. against Hall in the 2-mile run for blocking a runner, but this was not allowed. Wason won second in the hammer throw, but was protested on account of having been at another university inside of a year; and his work was thrown out.

The races were very interesting, and up to the last of the meet the chances seemed even; but, when Brown took all the points in the 2-mile run and the hammer throw, it was seen that she would surely win the meet. The work of Frost, a new man at Tech, deserves especial mention. He ran in the distance events, and made an excellent showing.

THE GRADUATES

WALKER MEMORIAL COMMITTEE

The efforts of the committee and its associates continue to bear good fruit, although particular classes have still much to do. The

status of the subscription at the time of the Alumni Reception of June 5 is shown in the following table in comparison with that at the December meeting. The figures for '68, '78, '85, and '93, are eloquent.

Class.	No. of Graduates.	Amount of Subscriptions. Dec. 29, 1899.	June 1, 1900.
'68	14	$1,850.00	$1,850.00
'69	5	25.00	25.00
'70	10	1,260.00	2,260.00
'71	17	70.00	70.00
'72	12	100.00	100.00
'73	26	175.00	200.00
'74	18	85.00	130.00
'75	27	320.00	500.00
'76	43	150.00	150.00
'77	32	175.00	275.00
'78	19	2,750.00	2,750.00
'79	23	1,025.00	1,025.00
'80	8	10.00	60.00
'81	28	150.00	215.00
'82	24	235.00	240.00
'83	19	140.00	510.00
'84	36	800.00	1,150.00
'85	27	2,270.00	2,970.00
'86	59	400.00	835.00
'87	58	350.00	1,785.00
'88	77	500.00	1,425.00
'89	75	1,290.00	1,870.00
'90	102	1,015.00	1,045.00
'91	103	205.00	1,025.00
'92	133	675.00	875.00
'93	129	2,180.60	2,850.60
'94	138	297.50	655.50
'95	144	455.00	765.00
'96	188	85.00	210.00
'97	179	724.00	910.00
'98	199	623.00	793.00
'99	172	—	695.00
Walker Club,		600.00	600.10
Civil Engineering Society,		—	100.00
Former Instructor,		—	50.00
	Total,	$20,990.10	$30,969.10

NORTH-WESTERN ALUMNI ASSOCIATION

The *Tech Bulletin* for April, 1900, a one-page paper, issued by the North-western Association, makes the following announcements: "Monthly meetings and suppers are held on the 16th of each month, at 6.45 P.M., at 'The Bismarck,' 180 Randolph Street. When the 16th falls on Saturday or Sunday, the meeting occurs on the following Monday. Summer meetings will be held at 'The Bismarck' Garden, Grace and Halsted Streets, during June, July, August, and September."

"It is our desire to make these meetings popularly scientific or scientifically popular, without disturbing the dry dust of technical erudition or losing the social feature. We want to make them attractive to all members, believing that with our wider sphere of usefulness the Institute will be greatly benefited. The attempt has been highly successful thus far, and we hope it will have the indorsement of our interested friends."

THE TECHNOLOGY CLUB

The season of smoke talks at the club closed on May 8 with a lecture on Cuba by Mr. Edwin F. Atkins, illustrated with many excellent lantern slides. Mr. Atkins owns one of the largest sugar plantations on the island. The members of the club were treated to an interesting account of that part of the history of Cuba, before and during the late war, which it has been impossible to get from the newspapers. The unbiassed account was told in a modest manner, and most intelligently.

The usual light refreshments were served in the dining-room after the members had asked questions about the evening's talk. With this talk, the large attendance, and interest shown by the members, the evening afforded a successful and satisfactory ending of a pleasant season. Already for next year an attractive list of speakers has been planned.

The rooms of the club were used in Junior Week by the Junior Class for a reception to the matrons of the "Prom." It made a

graceful opportunity for those who attended the "Prom." to meet their partners for the dances of the evening.

On Tuesday, June 5, the evening of Commencement Day, an informal reception was given by the club to Dr. Henry Smith Pritchett. Invitations were sent to all members of the club, to members of the Alumni Association, of the Society of Arts, of the Corporation of the Institute, and of the instructing staff. Mr. James P. Munroe, president of the club, Mr. Edwin C. Miller, president of the Alumni Association, and Mr. William Endicott, a member of the Corporation, received with Dr. Pritchett. President Crafts was unable to be present. Messrs. Henry P. Talbot, '85, Frank L. Locke, '86, Edward G. Thomas, '87, Arthur T. Bradlee, '88, William S. Johnson, '89, William Z. Ripley, '90, George A. Campbell, '91, Leonard Metcalf, '92, George V. Wendell, '92, Walter E. Piper, '94, Charles P. Moat, '96, Walter Humphreys, '97, and Paul R. Brooks, '00, as ushers, introduced the many guests to Dr. Pritchett and the receiving party, who stood in the "common room," on the side opposite the stairway. The outside of the club-house was decorated with Japanese lanterns, and the inside with potted plants and cut flowers. Strawberries and ice-cream were served in the dining-room. During the evening it was whispered about that, as it was "Tech" night at the Pop concert, every one was going to Mechanics' Hall later in the evening. At half-past nine a carriage stopped at the entrance of the club; and the President-elect and president of the club were driven to the hall, where many Tech alumni lined up on either side of the middle aisle, and cheered and cheered, enough to rend the roof, as Dr. Pritchett and his escort were ushered up this aisle into a nest of graduates. It was a royal reception.

During this last season the receipts and expenditures have greatly increased,—a fact which shows that the club has been used more than ever. The number of applications for new membership has also increased. The limit of the membership will soon be reached, and a waiting list will be necessary.

NEWS FROM THE CLASSES

1873.

SAMUEL E. TINKHAM, *Sec.*

City Hall, Boston.

Mr. George H. Kimball, the new chief engineer of the Père Marquette Railroad, was born at Newburyport, Mass., December 8, 1849. He was educated at the Massachusetts Institute of Technology, class of '73. After two years in engineering and surveying, he entered the Motive Power Department of the Pittsburg, Cincinnati & St. Louis as a draughtsman in September, 1875. In April of the following year he was made superintendent of bridges and buildings with the same company. He was superintendent of the Columbus and Sunday Creek Valley, now part of the Toledo & Ohio Central, from October 1, 1879, to January 19, 1880, and then returned to the Pittsburg, Cincinnati & St. Louis as engineer of Maintenance of Way. A year later he was appointed chief engineer of the south-eastern extension of the Toledo, Delphos & Burlington. From October 14, 1882, to January 1, 1889, he was superintendent of the First and Second Districts of the New York, Chicago & St. Louis. He was made chief engineer of the Lake Shore & Michigan Southern on February 19, 1889, and consulting engineer of the same company July, 1891. He continued in this position until September, 1898, when he was appointed superintendent and chief engineer of the Columbus, Sandusky & Hocking. He assumed his present position on March 26.— Alexis H. French has become an associate member of the Alumni Association. He is president of the Boston Society of Civil Engineers for the year 1900–1901.— Shailer & Schniglau, of which R. A. Shailer, '73, is president, were the lowest bidders on the tunnel section of the East Boston Tunnel Work. Their bid was a little less than $1,000,000, and the work to be completed June 15, 1903. The work done by this company on two sections of the subway was very satisfactory to the subway officials.—

S. M. Felton, who is a member of the M. I. T. Corporation, as well as president of the Chicago & Alton Railroad, was in Boston with the Commercial Clubs of St. Louis, Chicago, and Cincinnati, as was also George O. Carpenter, '73, one of the leading citizens of St. Louis, and vice-president of the St. Louis Lead Company. Mr. Carpenter is a recently elected associate member of the Alumni Association.

1874.

CHARLES F. READ, *Sec.*

Old State House, Boston.

The twenty-eighth annual reunion of the Class Association was held at the Technology Club on January 25, and was attended by a large number of members. At the conclusion of the dinner a business meeting was held, at which the following gentlemen were elected officers for the present year: president, Willis R. Russ; vice-presidents, George H. Barrus and John C. Chase; secretary and treasurer, Charles F. Read.— The Class Association, having voted to hold quarterly reunions in the form of one o'clock lunches, the first one was held at Marliave's Restaurant, Boston, on April 18, and was greatly enjoyed by all who attended.

1875.

E. A. W. HAMMATT, *Sec.*

53 State Street, Boston.

John C. Sherlock is quite a club man, being a member of six clubs, and has been township treasurer three times. His address is 3875 Clifton Avenue, Cincinnati, Ohio.—F. E. Okie is in the printing ink business, with factory in Philadelphia. His business address is 124 Kenton Place, Philadelphia, Pa.— Amos J. Boyden has recently been in town. He is quite busy with his private practice, and as superintendent of construction for the United States government of the Mint at Philadelphia, Pa.— William R. Webster is going abroad this summer on professional business, and incidentally will visit the fair at Paris.— Some additional subscriptions to the Walker Memorial Gymnasium Fund have recently been received from '75 men. Others are hoped for.

1877.

RICHARD A. HALE, *Sec.*

Lawrence, Mass.

E. C. Woodward, formerly of class of '77, is located at Colorado Springs as assayer and chemist.— John Alden has given an interesting talk in Andover recently before one of the societies on the History of a Lump of Coal.

1882.

WALTER B. SNOW, *Sec.*

Watertown, Mass.

Albert C. Brackett, who was obliged to relinquish his architectural work on account of trouble with his eyes, is now connected with C. K. Amidon & Son, 45 Milk Street, Boston, in the real estate and fire insurance business. His home is at Newton Centre, Mass.— Harry G. Manning was at last accounts in Chicago, putting into operation the enlarged plant of the Simonds Manufacturing Company. He was present at the Cincinnati meeting of the American Society of Mechanical Engineers in May.— A son, Robert Bonney Herrick, was born to Mr. and Mrs. Rufus F. Herrick at Winchester, Mass., on May 4, 1900.— Alfred L. Darrow has changed his place of residence to 25 Harris Street, Cambridge, Mass.— Charles J. A. Wardwell, of Laconia, N.H., who was with the class during his Freshman year, has just been awarded an elaborate patent, having no less than forty-two claims, for new form of automatic power-operated knitting machine.— On May 11, J. P. Munroe spoke at Bridgeport, Conn., before the Fairfield County Teachers' Association, on "The High School and the Citizen."— *The American Engineer and Railroad Journal* of May, commending the idea of "lectures delivered by the best non-resident engineers and men of authority that the country affords to engineering students, . . . of which many of our technical schools and colleges are availing themselves," gives among the names of such lecturers those of Walter B. Snow, and F. H. Newell, '85.

1883.

HARVEY S. CHASE, *Sec.*

8 Congress Street, Boston.

George H. Gustin, connected with the Bowker Fertilizer

Company at Elizabeth, N.J., has been successively chemist, superintendent, manager of factories, and "manager of the New York business." — David Wesson, sends out a pamphlet of forty pages, setting forth the advantages and uses of the "Wesson Cooking and Salad Oils" made by the Wesson Process Company of New York and Philadelphia. It is stated to be an absolutely pure vegetable oil, and its use is urged in place of lard or butter.

1884.

DR. AUGUSTUS H. GILL, *Sec.*

Mass. Inst. of Technology, Boston.

Mr. H. F. Baldwin, M. Am. Soc. C.E., engineer of Maintenance of Way of the Erie Railroad, has been appointed chief engineer of the Chicago & Alton Railroad, in place of Mr. H. C. Draper, who will continue with the engineering department of the road.

1887.

EDWARD G. THOMAS, *Sec.*

4 State Street, Boston.

Draper and Sprague made a trip early in the spring to mining properties at Pyramid, Ariz., in which they are interested. Mr. Sprague made an extended trip in California before returning.— H. S. Adams and E. G. Thomas will spend the month of June in California and Colorado, investigating mining properties.— Henry F. Bryant has established a branch office of his firm, French & Bryant of Brookline, at 4 State Street, Boston.

1889.

FRANK L. PIERCE, *Sec.*

31 Milk Street, Boston.

H. H. Hunt has lately accepted the position of manager of the Tampa Electric Company, Tampa, Fla.

1891.

CHARLES GARRISON, *Sec.*

Lexington, Mass.

The annual meeting and dinner of the class of '91 were held at the Technology Club, April 21, 1900. The following twenty-two members were present: Fiske, Forbes, Dart, Young, Campbell, Bird, Dana, Blanchard, Ambrose, Bradley, Palmer, Garrison, Cunningham,

Goodwin, Damon, Tappan, Bryant, Knowles, Hatch, Wilson, Wilder, Douglas. The business meeting was called before dinner by the retiring president, Mr. Cunningham, when new officers were chosen for the next term of three years. Henry A. Fiske was chosen president; Charles Garrison, secretary and treasurer; Harry C. Bradley, assistant secretary. An excellent dinner followed. The menu was cleverly designed by Mr. Bird, who always presents to the class a characteristic sketch to be used on such occasions. His versatility in this line can be seen almost every day by readers of the Boston *Herald*. The dinner passed merrily, and we then took up the annual salary list. The highest of those present was $6,000; lowest, $1,200; average, $2,457. The average last year was $2,150. Mr. Forbes then spoke at length regarding the Walker Memorial, and succeeded in adding some new names to his subscription list. The members present voted to have a class pamphlet printed in time for the annual dinner next April, for which a subscription of one dollar each was to be taken from the class. It is good to have it recorded, as memories are apt to lapse when subscription time comes. At about ten o'clock the gathering began to break up, after a most successful meeting. We hope to gather together a much larger representation of the class of '91 at the next meeting, and spread the class fellowship, which is so much appreciated by those who do attend.— Charles W. Hansen died of consumption on April 8 at Santa Fé, N.M. During the past year he has resided in Orange and Santa Ana, Cal. The remains were taken to Chicago for burial. Mr. Hansen leaves a widow and one child.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*

Purdue University, Lafayette, Ind.

Mr. Frederick L. Francis, Course IV., of Fitchburg, Mass., sailed from New York May 26, accompanied by his wife and sister, for a considerable stay in Paris, followed by a short Continental tour. — W. Spencer Hutchinson is at present in Carthage, Mo., to which place he went January 1, to assume

the duties of superintendent of the Boston Get There Zinc Company's mines. He has thus far been engaged chiefly with business matters connected with the company, but is actively pushing the technical development of the property and investigating the feasibility of erecting a concentrating mill.— Arthur J. Ober, of the United States Engineer Corps, who has been located for some time past at Wood's Hole, Mass., has been transferred to Phillipsdale, R.I., where he is supervising certain dredging work that is being carried on in the Pawtucket River. Ambrose Packard is the contractor upon this work.— The wedding of Lawrence B. Manley, of Boston, to Miss Florence I. Everett, of Manchester, N.H., daughter of the late Frank O. Everett, of Worcester, was announced on February 6, 1900.— The marriage of Mr. Richard Waterman to Miss Grace Edna Mathews, at Chicago, Ill., April 28, 1900, was recently announced. Mrs. Waterman is a sister of Dr. Albert Prescott Mathews, '92, Assistant Professor of Physiology in Tufts College Medical School. Mr. and Mrs. Waterman will reside at 26 Scott Street, Chicago, Ill.— Philip M. Burbank was married June 12 to Miss Annie Mason Bailey, both of Waltham, Mass.—William E. Scales, formerly of Newton, Mass., who will be remembered by many '92 men, was married June 12 to Ella E. Griffin, of Galveston, Tex. They will reside at 1310 Ball Avenue, Galveston, Tex.— Macy S. Pope was elected an associate member of the American Society of Civil Engineers on May 2.— D. C. Heath & Co. have published a book on "School Sanitation and Decoration," the chapters on sanitation being written by Severance Burrage.— The Class Directory was issued in May. Any one connected at any time with '92, desiring a copy, may have one by applying to the class secretary.— The class of '92 was represented by the following men at the reception given to Dr. Henry S. Pritchett at the Technology Club, June 5, 1900: Bigelow, Braman, Derr, Heywood, Ingraham, Marcy, Mathews, Metcalf, Pope, and Wendell.— On June 6 Mr. Francis H. Kendall, of the class of '90, and Miss Lilly Miller, of

the class of '92, were married at Medford, Mass.— George F. Rowell has lately been appointed assistant engineer with the Pennsylvania Water Company of Wilkinsburg, Pa.—The February issue of the *Bulletin de la Société d'Encouragement pour l'Industrie Nationale* contains an article on "An Apparatus for Testing Injectors," by C. F. Park. — Professor Francis Walker, son of the late General Francis A. Walker, is to head the department of political and social science in Western Reserve University. He has had the same department in Colorado University.

1893.

FREDERIC H. FAY, *Sec.*

60 City Hall, Boston.

The seventh annual meeting and dinner of the class was held at the Technology Club on Saturday evening, March 24, 1900, Vice-President Crosby presiding in the absence of President William B. Page, who could not be present because of serious illness in his family. Following the reading of the reports of the secretary-treasurer, and of the committee to prepare resolutions upon the death of Herbert W. Stanwood, the Committee on the Technology Club Gift reported the presentation to the club of a silver punch-bowl and coffee-urn. The class voted to pay the Association of Class Secretaries an amount equal to twenty cents for each of our living graduates, a similar contribution being requested of all classes, for the purpose of carrying on the work of the Association. The following officers were elected: president, William W. Crosby; first vice-president, Grosvenor T. Blood; second vice-president, Herbert N. Dawes; secretary-treasurer, Frederic H. Fay; assistant secretary, Charles M. Spofford. After the dinner the club listened to an interesting talk by R. N. Wallis, president of the Fitchburg (Mass.) Common Council, who told of his experiences in politics. C. M. Spofford spoke briefly of the changes that had taken place at the Institute during the preceding year, and also made a statement as to the progress of the Walker Memorial Gymnasium Fund. The last speaker was

S. C. Keith, who presented a paper illustrated by the lantern upon "The Milk Question from the Bacteriological Standpoint." Interspersed with the speaking were a number of vocal selections rendered by J. R. Burke, who is a musician of ability and careful training. One guest and the following members were present: Barton, Blood, Blake, Burke, Biscoe, Cook, Crosby, Cadwell, Dawes, Keith, D. D. Jackson, A. L. Kendall, H. A. Morss, E. S. Page, Pickert, W. T. Peck, C. W. Sawyer, Spofford, Tomfohrde, R. N. Wallis.— Harry Hill Thorndike, formerly a special student in architecture, spent a part of 1898-99 in Italy and France. He is a member of the Veteran Association, First Corps of Cadets, Boston, in which organization he has served over five years; and he belongs, as well, to the Somerset, Athletic, and Country Clubs of Boston.— Walter Woodbury Patch, of Boston, and Miss Alice Winnifred Walker, of Marlboro, Mass., were married April 5, 1900.— Willis T. Knowlton is in Honolulu, Hawaiian Islands, where he has a position as assistant engineer on the construction of the sewerage system of Honolulu.— Frank Houghton has been made assistant cashier of the National Exchange Bank, Boston. — Philip B. Day, a son of Rear-Admiral Day, U.S.N., was married April 26, 1899, to Miss Ernestine Alberg, of Columbus, Ohio. Day is engaged in stock-farming at Glasgow, Va.— George S. Barrows, of Gloucester City, N.J., engineer for the Welsbach Light Company, was consulting engineer, in charge of the lighting plant of that company, at the National Export Exposition, Philadelphia, in 1899. Barrows is a member of the Military Order of the Loyal Legion, University Club of Philadelphia, Merion Cricket Club of Haverford, Psi Upsilon Club of New York, and the Franklin Institute, Philadelphia. — Since leaving the Institute, S. H. Brockunier has been engaged in a variety of mining works, having reported upon a number of gold and coal mines in Colorado and Canada, in addition to his work as general manager of the Virginia Mining Company of Ontario, Limited, at Rat Portage, Ontario. In 1899 he received from Dickinson College

the degree of A.M. Brockunier has published a series of letters on "Life in Northwestern Ontario." — Charles Winthrop Sawyer delivers each winter a course of lectures on Architectural History before classes of the Boston Y. M. C. A. He is also known as an occasional writer of short stories of adventure.— Dr. Augustus B. Wadsworth, who, subsequent to his graduation in biology with our class, took up the study of medicine and graduated in 1896 at the College of Physicians and Surgeons, New York City, has been assistant in bacteriology and alumni fellow in pathology at the above institution, as well as physician at St. Luke's Hospital, New York City.— Wallace C. Lambert, principal assistant to John R. Worcester, consulting engineer, 53 State Street, Boston, assisted the latter in the design of the steel work for the train-shed of the South Station, Boston's new terminal, which is the largest railroad station in the world. Lambert has also had charge of the design of a considerable portion of the steel work for the new Boston Elevated Railway, now in process of construction. — F. H. Howland, IX., who is representing the Providence *Journal* in South Africa, has been engaged to take Julian Ralph's place on the staff of the London *Daily Mail* with Lord Roberts's column.

1894.

SAMUEL C. PRESCOTT, *Sec.*

Mass. Inst. of Technology, Boston.

J. Calvin Locke has left the employ of the city of New York to accept the position of assistant civil engineer upon the reconstruction of Dry Dock No. 2, under the United States Navy Department, Department of Yards and Docks, New York Navy Yard, Brooklyn, New York City.

1895.

E. H. HUXLEY, *Sec.*

29 Hampshire Street, Camb'port, Mass.

The subscriptions to the Walker Memorial Gymnasium are still coming in, but slowly. The secretary urges all to subscribe.— Edmund D. Barry was married on June 4 to Miss Catherine Clapp Humphreys, of Dorchester.— The secretary would like to receive letters from

the class members from time to time, giving news of general interest to be published in the REVIEW.

1897.

JOHN A. COLLINS, JR., *Sec.*

55 Jackson Street, Lawrence, Mass.

Allen W. Jackson, IV., was married on March 26 to Miss Mary Elizabeth Balch, of Malden, Mass.— Charles W. Bradlee, IX., has entered into partnership with John E. Chatman for the purpose of selling and installing the Magee warm air and combination heaters. He is located at 93 Kilby Street, Boston.— In a letter from William A. Kent, dated Jolo, Philippine Islands, January 11, 1900, Mr. Kent writes: "I have just been appointed engineer officer, District of Jolo, with instructions to make a road sketch from here to Maiban, the residence of the sultan on the other side of the island,— about fifteen miles, I believe. I shall have to improvise my sketching-board, as we have none on hand. In fact, I believe a self-reading rod and a tripod constitute the sum total of our instruments here." — A. E. Kimberley, formerly with the Lawrence Experimental Station, Massachusetts State Board of Health, then later with Farben-Fabriken, of New York, has recently returned to the Experiment Station.— Edwin R. Motch was married on May 23 to Miss Ottie May Carpentar of Covington, Ky. Mr. Motch is located in Cleveland, Ohio. — Edward H. Woodworth, V., was married on Tuesday, June 19, to Miss Edith Louise Drury, of Newtonville, Mass.— Attention of the members of '97 is called again to the subscriptions for the Walker Memorial Gymnasium Fund. The total amount given by the class as yet is in the neighborhood of nine hundred dollars. One point of interest is that '97 is among the leaders as regards the number of men subscribing, which fact is hopeful, although we may not have attained a high position as regards amounts. Let those who have not given send in their names either with cash or with promises for the future. — Stanley Howland is at present first lieutenant of Company E, Twenty-fourth United States Infantry, stationed at San José in the northern part of the island of

Luzon. He entered the army as second lieutenant in 1898, during the Spanish War, and was promoted in June, 1899.— The following is taken from the Springfield *Republican* of June 8, 1900: "William Thornton Parker, Jr., of this city died in the Cambridge Hospital of cerebral apoplexy at 3.25 yesterday afternoon, after a week's illness. His death is the result of overstudy, as his ambition led him to take a high stand in the Harvard Law School, from which he would have been graduated in a few days, had he lived. His illness and death have come as a sudden and severe blow to his friends. He was taken ill only last Friday, and there had been no hope for his life from the first. For the three weeks previous to his illness he complained of severe headaches, and consulted physicians about them, urging them to endeavor to keep up his strength until June 4, when his last examination would take place. On Thursday night some of his friends heard a heavy fall in his room, and on entering found him lying unconscious on the floor. They put him on his bed; and he recovered consciousness in a short time, but soon began to complain that his limbs and face were beginning to feel paralyzed. Slowly he became entirely paralyzed and lost consciousness, and remained in that condition until his death. William Parker was one of the best known and most thoroughly respected young men in this city, and all his friends will sincerely mourn his loss. His mind was exceptionally mature and strong. He was well informed on many subjects, and took an active interest in all current events. For the past seven years he had spent the winters in Boston, while studying at the Massachusetts Institute of Technology and the Harvard Law School; but he had made frequent visits in this city, to be with his family and to attend social functions. His ambition was to become a corporation lawyer in Boston, and his achievements in the schools gave every promise of his chosen profession. An alert student, he would grasp a subject readily, and then hold it with rare tenacity. During the past winter he had delivered three lectures at the School of Technology on municipal government, and had been requested to give more

next winter on constitutional law. This is considered a great honor among the graduates of the School, and is a proof of the light in which the Faculty under whom he had worked for four years regarded him. By nature he was a quiet man, who would not show his knowledge unless it was drawn from him in conversation; but then every sentence and idea came clear-cut and to the point. William Thornton Parker, Jr., was the only son of Dr. and Mrs. William T. Parker, and a grandson of the late John B. Stebbins, of this city, and the late Dr. Benjamin Parker, of Boston. He was born in this city in 1876, and spent his childhood in part here and in Newport, R.I. He had travelled extensively, and was familiar with European countries. He was graduated with honors from the Springfield High School in the class of 1893, and entered the Institute of Technology with honors. At the school he was one of the leading men in his class, both in studies and socially. He was a member of the Technology Chapter of the Delta Psi Fraternity, and belonged to several of the social clubs. He was also a member of the Story Law Club at Harvard. He was graduated with the class of '97, standing near the head, and then entered Harvard Law School, where he was just finishing his course. In the Law School his career was like that in the lower schools, and he took high rank again. In addition to his studies he became interested in rowing, and was on the Weld law school crew during the three years of his course. When spending his summers in this city, he also rowed, and was a member of the Springfield boat club eight."

1898.

C. E. A. Winslow, *Sec.*

Hotel Oxford, Boston.

G. E. Bergstrom has left Boston to take a position at Neenah, Wis.— C. E. Bray is in the office of the city engineer of Somerville.— E. F. Currier is with the Hamilton Woollen Company of Amesbury, Mass.— W. R. Dodge has been in Mexico this spring on professional business.— G. R. Wadsworth, who is assistant engineer of the Middle Division, N. Y. C. & H. R.R., stationed at Albany, was in Boston early

in May, and talked over old times with some of his classmates.— J. F. Sickman is in the United States engineer's office at Tuscaloosa, Ala.— H. W. Jones, who will graduate from the Harvard Medical School next year, has recently joined the Technology Club.— C. A. Stickney, 134 Nina Avenue, St. Paul, is president and manager of the Charles A. Stickney Company, engaged in the manufacture of gasolene engines.— C. H. Smith is with the Providence Engineering Works as a draughtsman.— W. D. Blackmer is superintendent of the Tornado Mine, Cripple Creek, Col.— J. F. Kelly has an architect's office at 100 William Street, New York City.— G. A. Hutchinson, who spent his first year after graduation in the shops of the Nordberg Manufacturing Company at Milwaukee, has just completed a second year with the same company, devoted to the work of the draughting-room.— Miss M. J. Thomson is teaching science at the Prospect Hill School, Greenfield, Mass.— A. L. Goodrich is assistant chemist with the Union Oil Company at New Orleans.— The reunion of '98 men at the Technology Club on March 27 was a great success. Thirty-one men were present, A. L. Swasey from Philadelphia being long-distance man. The meeting was announced as an informal one, and the term proved appropriate. Another such reunion will be held early in the fall.— R. E. Daly, D.D.S., is practising as a dentist at 10 Tremont Row, Boston, Mass.— '98's record in the Walker Memorial Gymnasium shows a total of seven hundred and ninety-three dollars subscribed by twenty-seven men. This is still nearly a hundred dollars behind '97. '98, this way!— F. L. Twombly is connected with the United Mills and Export Company of New York, and is conducting an extensive flour trade with Porto Rico.— J. G. Coffin and A. A. Blanchard will hold Graduate Fellowships for the ensuing year. Coffin intends to take a Ph.D. at Clark University, Worcester, and Blanchard is to study in Germany.— W. W. Ward is with Ernest Flagg, one of the leading architects in New York, and is doing exceptionally good work.— George B. Pillsbury, formerly a member

of the class of '98, M. I. T., has graduated first in his class at West Point, and is expecting to enter the Engineer Corps of the United States Army. It is claimed that his record is exceptionally strong, the best in a series of years. The following press clippings are in point: "Cadet Pillsbury entered the Academy June 15, 1896." "He stands No. 1 in everything except discipline." (*Lowell Courier.*) "He stands head and shoulders above his class; and an officer remarked not long ago, 'There is room for a dozen men between him and second man.' He decided to enter the Institute of Technology, and, after his graduation from the high school, 'took up the Tech Course.' His year at Tech was of great benefit to him, and he did not regret his failure to secure entrance on the first physical examination." (*Boston Journal.*)

1899.

WALTER O. ADAMS, *Sec.*
1776 Mass. Ave., No. Camb., Mass.

The marriage of H. P. James to Miss C. Maude Jacobsen on May 13 at Waterville, N.Y., and of Everett H. Hinckley to Miss Mary E. Frost on May 10 at New Bedford, Mass., is announced.— Arthur Hamilton is secretary of the Marinette Iron Works Manufacturing Company at Marinette, Wis.— Miles S. Sherrill is soon to start for Leipzig, where he will study for two years.— Frank R. Swift left for Europe at the close of the school year. He will return to his position at the Institute in the fall.— J. A. Patch will leave during the summer for Beyrout, Syria, where he will take a position as professor of analytical chemistry for three years.— Lew Emery sailed for Europe immediately after Commencement. — Herbert M. Case is with the General Electric Company at Schenectady, N.Y.— Miss Edna Chandler is teaching at Brunswick, Me.— H. J. Skinner is with the General Chemical Company, Camden, N.J.— Informal class dinners were held at the Hotel Savoy in March and in April. They were fairly well attended, and enjoyable. No more will be held until fall. — Our contributions to the Walker Memorial Fund continue to grow. Nearly seven

hundred dollars has so far been subscribed. Every man should be heard from.— The marriage of Ralph W. Loud to Miss Charlotte L. Richards took place at Weymouth, Mass., on May 3, 1900.

1900.

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Ingersoll Bowditch has accepted a position with the Ludlow Manufacturing Company.— H. M. Harps goes to New Haven in the bridge department of the New York, New Haven & Hartford Railroad.— H. D. Jouett is with George R. Wadsworth, '98, on the New York Central Railroad at Albany.— C. E. Smith returns to Putnam, Conn., where he was employed a year ago by J. R. Card, a former Tech man.— Kenneth Seaver expects to be employed on the Pennsylvania lines west of Pittsburg under Thomas Rodd, chief engineer, with headquarters at Pittsburg.— Dean Hinman is with the city engineer of Taunton, Mass.— H. R. Stearns finds employment on Metropolitan Sewerage Work. E. F. Vogel is employed at Columbia, Ohio, by the Case Manufacturing Company, under W. R. Strickland, '98.—G. C. Gibbs has secured work with the Brown Hoisting and Conveying Company of Cleveland, Ohio.— Russell Suter may be found in the office of the city engineer of Cambridge.— F. W. Witherell has accepted a position with the Massachusetts State Board of Health.— G. E. Russell and C. M. Fosdick will remain at the Institute as assistants in civil engineering.

NECROLOGY

THURLOW WASHBURN *

THURLOW WASHBURN was born at the family home in Livermore, Me., on March 16, 1869. His father was the late Charles Ames Washburn, a writer and author, for a time editor of the *Alta California* in San Francisco, and once minister of the United States to Paraguay. Owing to the changes in his father's life and occupations, Thurlow's early schooling was secured with many interruptions, as well as at various places, up to his sixteenth year, which found him in Andover, Mass. A spirit of adventure and love of outdoor life, which was part of the man's character, seems to have controlled him at this early age; for in that year (1885) he started for Colorado with a friend, Charles Pruden by name, with the idea of building a flat-boat, and floating down the Platte and Missouri Rivers on a voyage of discovery. One can imagine the glowing colors in which the adventures of such a trip through the Far West would be pictured in the mind of the New England boy. The journey to the point of beginning was made, and the boat was

* In the issue of the TECHNOLOGY REVIEW of last January there appeared in the section of "News from the Classes" a short notice of the death of Thurlow Washburn of the class of 1891. Within little more than two years after graduation, before the fruits of the four years of hard Institute work could be reaped, his career was closed. The associations and incidents of his student life are still fresh in the minds of his classmates and college friends. The circumstances of his death were peculiarly tragic. He died in the courageous performance of duty, which calls for honorable mention and emphasis. For these reasons this short sketch has been prepared for publication in the TECHNOLOGY REVIEW.—A. W.

built; but the voyage was cut short because of lack of water, sand-bars becoming too frequent for navigation to be practicable. Funds were also at a low ebb, and the friend was obliged to seek refuge from the vicissitudes of the voyage of discovery in employment on a sheep ranch. Washburn returned home, but after a brief stay rejoined his friend on the ranch, and shared with him for some little time the hardships and exposures of herding on the plains. The prospects for the future in sheep ranching were, however, not alluring; and this fact, combined, probably, with the revival of the spirit of adventure, stimulated the two friends into a new undertaking still farther west. A small pack outfit and a few horses were gotten together, and a migration south-westward was begun across Eastern Colorado, with Arizona as the ultimate destination, where it was proposed to take up a homestead. Progress was interrupted by a number of obstacles and accidents, which culminated at the crossing of the Rio Grande, near the town of Taos in Northern New Mexico. Here, while attempting to ford this stream where it flowed through a deep canyon, several of the horses were lost; and the young men were left without means of transportation. While waiting here, undecided what to do, they became acquainted with an old American squatter and hunter, who induced them to locate in a little settlement of Americans called "The Lobo." Here they built a cabin, appropriated some land, and started farming. They continued here for six months; but the undertaking did not prove immediately remunerative, while the prospects for the future were poor. Pruden became discouraged, and travelled back east over the Rocky Mountains to the cattle and sheep-grazing country about Springer, and was there again employed as a hand on a sheep ranch. Washburn remained one winter after this in "The Lobo," hunting and doing a little prospecting, He then joined Pruden in Springer; and, with some money which he had, they bought a bunch of horses, and started into horse ranching. Misfortune, however, still seemed to follow them. The herd of horses was maintained for some little time successfully; but, eventually, it was scattered, and in large part lost in a very severe blizzard and snow-storm. This disaster, together with the fact that the price

of horses had fallen to almost nothing, induced the friends to abandon this line of business also. What remained of the lot of horses was gathered together and driven into Southern Kansas, where they were sold, one at a time, to the small farmers. After disposing thus of what remained of the stock, the young men sold the balance of their outfit, and returned East.

About the latter part of the year 1891 Washburn entered the employ of the New York Central Railroad. He first occupied the position of assistant trainmaster on the Mohawk division. Later he was stationed at Buffalo as assistant trainmaster. About the end of the year 1892 he was placed in charge of the construction work of the signal system which was then being installed on the western division. This work, according to all accounts, he performed satisfactorily to the company and with much credit to himself. He was in the employ of this road at the time of the labor strikes in Buffalo, as an aid to Mr. Webb. About the end of May or early in June of 1893, on account of changes in the local management, he resigned from this employment.

In the autumn of 1893 Washburn entered the Massachusetts Institute of Technology, though he had now reached the age of twenty-four years, somewhat late in life to start the study of a new profession. In taking this step, he was influenced largely by the realization that, to gain advance in a technical profession, liberal and thorough education was of first importance. He was further guided at this stage by the advice of a friend, who, writing in testimony of his faithful and efficient work for the railroad company, speaks of having urged Washburn to take this step with the belief that he would be most successful in a life devoted to utilizing natural forces. Undoubtedly, his experience in the Far West, where contact with prospectors and mining men is constant in almost every vocation, had turned Washburn's attention in the direction of mining, and at the same time must have suggested the need of technical education. It was characteristic of the man that, at an age when many young men feel that their career is already unalterably blocked out, he should have recognized the mistakes of his boyhood, and by patient, earnest endeavor have tried to re-

pair what he must have realized he had lost through the interruption of his early education.

Washburn's course at the Institute occupied the full four years. He was graduateed in 1897, with the degree of Bachelor of Science in Mining Engineering. While at the Institute, he took active interest and was prominent in class affairs, holding, among other positions, that of Business Manager of the class publications. During the first year of the course, Washburn became acquainted with William C. Potter, a classmate, with whom warm friendship soon sprang up. Both young men selected the mining profession; and, from an early date in their friendship, they began to talk of and to plan for an extended trip through the Western States after graduating. Washburn's early experiences had familiarized him with the ways and means of Western life, and his trials and adversities seemed to have in no wise diminished his ardor for fresh undertakings. Accordingly, at the end of the college course, in the summer of 1897 the two friends met in Chicago, Potter's home, and proceeded thence to Denver. There they bought horses, wagon, and camping outfit, and started westward into the mountains. They first visited Central City; and, after inspecting the mines and mills of that camp, they travelled southward through the Rocky Mountains, visiting almost all of the important mining camps of Colorado. From that State they passed into New Mexico, following, in a general way, the Rio Grande. They finally stopped at a small town called Chloride, which had some years ago experienced a mining boom. They settled for the winter in a cabin in the neighborhood of Chloride, and engaged in prospecting, hunting, and fishing.

In the spring of 1898 Potter entered the employ of the Liberty Bell Gold Mining Company at Telluride, Col.; while Washburn remained in the neighborhood of Chloride, occupied principally in prospecting and developing certain mining claims in which the friends had become interested. Through Potter's association with the company, I was first led into correspondence with Washburn. During the summer of 1898 I engaged him to conduct certain examinations in our interest in the Black Range of New

Mexico, near where he was located. I first met him in November, 1898, at the little town of Fairview, late one evening after a sixty-mile drive in a dilapidated Mexican stage. I well remember the favorable first impression he made. Tall and spare, but of robust build, well hardened and tanned from outdoor life, with frank, open face, humorous twinkle to the eye, and unassuming manner, his was a personality well in harmony with his character, and one calculated to attract and interest at first sight. In conversation he was somewhat slow in expressing himself, but careful and painstaking. Something of the drawl and nasal accent of the "Down Easter" hung by him tenaciously. I spent several days in his company at this time, "batching" in the little cabin where he had established himself, near the mining claims. Here, with a few prospectors as companions, he led the rough-and-ready frontier life, doing his own cooking and housekeeping, sleeping on a rough cot of boards and blankets, with beans, bacon, and biscuits as staples of diet and "canned goods" as luxuries. He was up with the sun, all day at work over the claims, sampling, surveying, or even digging and blasting, with occasional hunting excursions after deer or antelope for recreation. A healthful, active life, with many recommendations and charms for the young man, though not very developing after a certain stage and usually unremunerative.

Washburn continued in the Black Range in the company's employ for about two months after my visit. Then, as the results of his examination failed to recommend the property to further consideration, he was transferred to Telluride. There he first took up the work of assayer, but in the spring of 1899 he was advanced to the position of assistant superintendent. In addition to the routine work of mine and mill assaying, while in the company's employ he gave special attention to the study of the problems of treatment, more particularly with reference to diminishing the loss in the tailings and to increasing the saving in the different stages of the milling. In this work he showed a ready grasp of the problems involved, and proved himself remarkably capable and thorough in devising and working out their solution. Indeed, there seemed to be developing in him, through this work, latent qualities as an in-

vestigator which had lain dormant in past years through lack of incentive or opportunity, and which promised to advance him rapidly in his late-chosen profession. He was in the midst of this work when the end came. The story of his death I have already told in the following words: —

On Thursday morning, October 12, he started on horseback from Telluride to inspect certain work being done for the company on the high mountain range. There was a light snow falling in the valley at the time he started, but nothing serious; and, as an early visit was of considerable importance, after discussing the matter with Mr. Mercer, the superintendent, he decided to go ahead as far as he could on horseback, then turn the horse loose, and proceed on foot. The horse came back about noon of the same day. The storm increased in violence, and continued until Sunday night; but no anxiety was felt, because it was supposed he had reached the cabin, and was waiting there until the storm let up. On Monday Mr. Mercer was preparing to go over the range, when two of the men arrived from the camp, and reported that they had seen nothing of Mr. Washburn. Parties were immediately sent into different basins, and search was continued uninterruptedly; but not until Wednesday was the body found, a short distance beyond the Virginius Pass. It appears that he must have been well started down from the pass toward the camp and cabin, almost within shouting distance, when a slide struck him, and threw him headforemost. He was found with about five feet of snow over him and two feet under him. Probably death came quickly, as there were no signs of his having struggled or suffered.

In analyzing Washburn's character, among the most salient traits are tenacity of purpose, courage, loyalty, and devotion to duty. The circumstances of his death strongly emphasize these qualities. The light snowfall of the early morning in the valley must have increased to a condition of some severity even before the horse was turned back; yet Washburn kept on. Before the summit was reached, the storm must have been very violent, and only those who have waded in soft snow against a blinding storm over the rough surfaces and steep slopes of those bleak summits

can realize the severity of the ordeal, or the exertion and determination necessary to gain the pass; yet still he kept on. The visit was important. If the camp was not reached, it would be days and perhaps weeks before another trip could be made. No slight obstacle of inclement weather was to deter him from accomplishing his object. Another who crossed the range, probably somewhat earlier in the day, reported the storm and his own experience as the worst he had ever encountered.

Washburn's mind was, ordinarily, not over-quick to act, but was well balanced and logical; and, though his conclusions might come slowly, they were generally reliable, and were perseveringly and faithfully deduced. In cases of emergency, however, he was capable of prompt action. A friend writes, "I know of several instances in his signal work on the N.Y. C. & H. R. R.R. where, with contradictory orders, blinding snow, and trains off of schedule, his quick judgment and great force have saved serious delays and possible accidents to his own construction train and crew and to the road's regular traffic." His nature, though retiring, was cheerful and social; and he soon became popular, and made warm friends of those with whom he was in contact. He was eminently fair-minded and liberal in both judgment and treatment of others. With him there was no selfish grasping for advantages over associates. His friends unite in testifying to the purity of his life. They also emphasize his quality of stanchness, which permitted no shirking of duty, no matter how severe or disagreeable the condition; and I can heartily join in this tribute. His untimely death has called forth many expressions of sorrow and affectionate remembrance; and in these sentiments I also join, for over and above the feeling of loss of a valuable assistant is the pain of separation from a good companion and loyal friend.

ARTHUR WINSLOW.

KANSAS CITY, MO.,
June 11, 1900.

REVIEWS

DISCUSSIONS IN ECONOMICS AND STATISTICS

By Francis A. Walker, Ph.D., LL.D., late President Massachusetts Institute of Technology. Edited by Davis R. Dewey, Ph.D. 2 vols. New York, Henry Holt & Co., 1899.

As President Walker's door was always left ajar, that students of the Institute might enter, so in these two volumes, which comprise some of his representative writings, are we presented with an opportunity to become better acquainted with him. However much we may treasure the memory of his courteous presence and recall the occasions when we learned something of his vigorous mind and his many interests, we cannot therefrom form an adequate conception or appreciation of his real life and character. Even the professors of the Institute, brought in close daily association with him, cannot for that reason claim to know him. He was like a many-sided mountain, and we may all know of him without realizing what is beyond our view. We may think, therefore, of this compilation, fortunately edited by one familiar with the subject-matter and possessing an intimate personal acquaintance with President Walker, as leading us to a vantage-ground from which we may see him better.

Dr. Dewey has selected typical and leading papers from the many which President Walker wrote as essays, lectures, and reports, most of which, but not all, appeared in print during his lifetime, and, after carefully annotating them with portions of other of his papers on similar subjects, has grouped them under the headings: Finance and Taxation; Money and Bimetallism; Economic Theory; Statistics; National Growth; and Social Economics. Within these classifications the papers are arranged chronologically, and each paper is preceded by a brief statement "to indicate the occasion of the lecture or address." References are made to articles bearing on the same subject as well as to the

publication from which the particular paper is taken. Besides embodying representative writings, therefore, these volumes to a considerable extent constitute a bibliography of President Walker's essays, and contain much information by means of which we are kept in touch with the events which formed the *motif*, or impulse, of his discussions. To state the work thus done is to show the labor and the skill necessary for its accomplishment. And that the editor has admirably succeeded in his purpose of giving us, not only "the content" of President Walker's thought, but also "the spirit which characterizes his work," we find upon examining the papers.

The first group, Finance and Taxation, begins with the earliest writing,— in 1868,— entitled "On the Extinguishment of the National Debt, by Poor Richard"; and the first sentences give us the note which sounds clear and true throughout his lifetime of discussion and thought, of straightforward, dignified good sense. He says: "I do not understand that the best way to pay the debt is either not to pay it or indefinitely to put off its payment. The first of these propositions, no matter what its form, is one that gentlemen do not discuss." And, concluding that we should pay our own debt, he observes: "A man may sometimes anticipate his earnings for a good economical purpose. . . . He has no right to leave the world poorer than he found it." As to financial plans, he remarks, "The best way of sinking a debt is to call in and burn the obligations." His opinion that there should be a fixed yearly sum for repayment he submits "to those who believe in the good old fashion of paying honest debts by honest work."

Two years later, in discussing the surplus, he pointed out with equal perception the absurdities in the tariff, such as the tax on drugs and chemicals, and "abominations," such as the salt tax. "We have no right," he says, "to measure the interest of the capitalist class, or even of the able and well-to-do laboring class, against the necessities of the helpless and dependent classes." To an opposite danger, however, President Walker was as keenly alive. "To lay the entire burdens of government upon property," he says in his article upon "The Bases of Taxation," "is a policy

so inequitable as to become flagrantly iniquitous." Deploring also a system of taxation which in reality reduces the income of labor, he considers a tax on "*faculty*, or native or acquired power of production, . . . to be the most equitable form of public contribution." His paper on "Protection and Protectionists" is replete with information and interesting argument, and free from the slightest trace of denunciation, which, he asserts, "should be preceded by a demonstration that it [protection] is socially inexpedient." He points out, however, that the United States itself is "the largest example of free trade mankind have to contemplate," and throws on the protectionists the burden of showing, at least, that the system they advocate may withstand "the well-known fallibility of law-makers and the evil liabilities which beset legislation."

The last of his papers on Finance, that on "Savings-banks," was left in manuscript form, now for the first time printed. It is an admirable statement of the history of savings institutions, particularly in England and the United States, the distinctions between which he accurately defines, showing how the Postal Savings, with its restrictions as to the amount of deposit, is superior to the American banks with their large depositors. Through it all we can see the earnestness with which he desired adequate and safe facilities for the encouragement of small savings and the consequent well-being of the people.

The papers on Money and Bimetallism tell us of President Walker's ideas on subjects in which he was vitally interested and as to which he gained world-wide reputation. They necessarily restate many of the thoughts so clearly set forth in his well-known books on these topics; but they also give us glimpses of his devotion to the principles he so earnestly advocated in the magazines, as a lecturer, as delegate to the Monetary Conference of 1878, and as president of the American Economic Association. He elucidated the quantity theory of money and ably expounded the principles of bimetallism. His position he skilfully defended, and he refused to be misunderstood or misquoted. In an address in the fall of 1896, which he had declined to deliver till after the election, he said clearly, "If bimetallism is, indeed, to be re-estab-

lished for the great objects which have been pointed out, it must be sought through an international agreement." And in a previous paper he denounced inflation as "the greatest danger to the integrity of our national currency," saying, "It should be fought from the start, on the line,— fought tooth and nail, fought to the death."

In the essays on Economic Theory we may find the same determined stand taken after exhaustive research and careful thought. He refused to accept doctrines of earlier writers. Instead of a system of abstractions, he insisted that political economy should be practical and human. Instead of an "economic man," he saw a laborer at his task, providing for the wants of his family; a manufacturer, influenced by changing habits of life and methods of business. Economics he separated from philosophy and theology, and made vital, "growing with the growing knowledge of the race, . . . something to which every man in his place may contribute; to which all classes and races of men must contribute if the full truth is to be discovered; something to which every clime and every age brings gifts all their own; something to which the history of institutions, the course of invention, the story of human experience, are not pertinent only, but essential." With admirable enthusiasm he adds, "In such a work who would not wish to join?"

His ardent individuality is also to be discerned in his attack upon the wage-fund theory, his thesis being that wages are paid from the product of industry, and influenced by the laborer himself. The originality and ability of his exposition provoked widespread discussion and criticism, which, in turn, called from him forceful rejoinders. We must admire his treatment of his critics. Even when accused of grossly misrepresenting accepted doctrines, his reply, though full of fire, was as generous, as dignified, and as carefully planned as were his official reports. Of the subject-matter his treatises on Political Economy and The Wages Question tell us; but the present papers, written without the opportunity for deliberative consideration, in the heat of debate, display to advantage his personal characteristics.

The articles before us relating to Statistics and to National Growth give an insight to President Walker's life in Washington and as head of the American Statistical Association, and show us his great interest in national conditions. As chief of the Bureau of Statistics and as superintendent of the Ninth Census, his success was immediate and far-reaching; and in these pages we can see the reason. He knew how to organize such work, and to him statistics were full of life and meaning. His interpretations of what to many of us would be pages of numbers are masterful. An interesting instance we find in his paper written in 1875 on "Our Domestic Service," which, though strictly not a statistical inquiry, like many other of his writings bears evidence of his statistical method. Speaking of the Southern States, he says: "We should look to see here an access of domestic service, due partly to an accumulation which has not had time to drain off, and partly to the force of habits deeply bred in master and in man. And so we find it. The census statistics show in 1870 there were but 4.29 families, high and low, rich and poor, white and black, to one domestic servant in Virginia; in Kentucky, 5.58; in Delaware, 4.83; in Maryland, 4.03. . . . West Virginia has 11.75 families to one servant. Is anything further necessary, to a student of history, to explain the cleavage that took place during the war in the old State,—the adhesion of the north-western counties to the cause of the Union, while the southern and eastern counties followed the fortunes of the Confederacy, 'whose keystone was slavery,'—than such a contrast as is thus presented in the statistics of domestic service in the two sections of the Virginia of 1860?"

Thus he made statistics most interesting reading, and not only by his ability of presentation, but also by his natural buoyancy and his national pride. In American agriculture he found that "the achievements of those who in this new land have dealt with the soil . . . surpass the achievements of mankind in any other field of economic effort." And, in writing of American manufactures, he says, "The natural resources of the United States, in field and forest and mine, are far beyond those of our rivals, England, France, or Germany, and all of them combined." Yet he was

never carried away by optimism. In 1870 he wrote: "The idea that, after all the tangible elements have been calculated and included, there still remains to be added some vast, undefined amount, all because we are 'a great and growing people,' or that the American eagle by himself is worth fifteen or twenty thousand millions of dollars, must be utterly discarded. . . . The gold and silver, the houses and lands, the railroads and shops, which we hold as the net results of our labor as a people, are worth just as much as the shops, railroads, lands, houses, silver, and gold of the unhappy subjects of absolute or limited monarchies, and no more." Perhaps fittingly his last public address, in December, 1896, was before the American Statistical Association, with which he was so closely identified. In part it was an earnest plea that the United States government should provide, as well as a military and naval academy to prepare men for war, some means of training for the statistical service of the country.

The last group of writings, which the editor has entitled Social Economics, bring us nearer to President Walker personally. His scientific papers abound in interest, and impress us with his store of knowledge and his familiarity with every phase of his discussions. To reread his thoughts is to add each time to our information, and to appreciate more the great zeal with which he worked. Of his writings on social conditions this is also true; but in these latter papers we come in closer contact with him as he was in his every-day life, deeply and humanly interested in the welfare of those about him. A real friend both to the laborer and to the employer, he brought to every dispute, with his clear power of perception, an honest mind and a sympathetic heart. He was never afraid of any socialistic project. "Whatever the programmes of men and societies," he says, "the socialistic movement will cease to determine when it begins to impair or manifestly to threaten the common, homely, every-day happiness and comfort of the masses." Speaking of sanitary inspection and regulation, he says: "For such good as I see coming from this source . . . I would, were it needful, join one of Fourier's 'phalanxes,' go to the barricades with Louis Blanc, or be sworn into a Nihilistic circle."

No one, surely, can quarrel with that; yet "*Utopias* of a few individuals" found little mercy at his hands. Competition he believed in thoroughly, and pointed out the dangers thereto brought about by the industrial corporation, adding as to the latter, "How absurd it is to claim for it the protection of *laissez-faire!*" The evils also of "those industries which in their nature tend to monopoly" he indicated; and he referred to "the rightful and growing — the fortunately growing — ambition and self-assertion of the working classes." But this is as far as he went. Ready to accept the benefit of every legislative act "honestly and prudently conceived to promote the public welfare," and finding in "every real and serious cause of complaint which is removed . . . a fresh occasion for loyalty, gratitude, and devotion," believing we should take account of "the natural aptitudes, the prevailing sentiments, the institutions, great and small, the political and economic history of a nation," in considering socialistic progress, he ever maintained that "the working classes have a real, a large and a vital part to perform in securing that distribution of the product of industry which shall promote the highest development of the industrial organism and at the same time minister to the health and strength of each part and member."

Restriction of immigration he steadfastly advocated, saying: "The question to-day is not of preventing the wards of our almshouses, our insane asylums, and our jails from being stuffed to repletion by new arrivals from Europe, but of protecting the American rate of wages, the American standard of living and the quality of American citizenship from degradation through the tumultuous access of vast throngs of ignorant and brutalizing peasantry from countries of Eastern and Southern Europe." "When was it," he asks, "that native Americans first refused to do the lowest kind of manual labor? I answer: When the foreigner came. Did the foreigner come because the native American refused longer to perform any kind of manual labor? No. The American refused because the foreigner came." And he adds: "All that sort of reasoning about the necessity of having a mean kind of man to do a mean kind of work is greatly to be suspected.

It is not possible to have a man who is too good to do any kind of work which the welfare of his family and of the country requires to be done."

The final paper of these discussions, "The Causes of Poverty," many will remember he used to read at the Institute; and in its words are his tones, his gestures, his earnestness, the charm of his presence. "My tale is told. At the beginning I warned the reader that I had no panacea to offer, no single, simple, sovereign cure for the woes and ills of humanity. We must strain out of the blood of the race more of the taint inherited from a bad and vicious past before we can eliminate poverty, much more pauperism, from our social life. The scientific treatment which is applied to physical disease must be extended to mental and moral disease, and a wholesome surgery and cautery must be enforced by the whole power of the State for the good of all. Popular education must be made more sensible, practical, and useful. The housewifely arts must be taught to girls in the schools, and there the boys must learn to use hand and eye and brain in a close and vital co-operation and co-ordination. Yet still we shall have to wait with patience the slow, sure action of time, the all-healer. The balance of social forces has definitely turned to the side of the less fortunate classes; and the course of events now runs in their favor, and no longer against them. Meanwhile let philanthropy continue its noble work in alleviating the afflictions which cannot be wholly cured, and in binding together rich and poor in ties of sympathy and mutual regard."

We need look no further to recognize the qualities that endeared him to all with whom he came in contact, that enabled him as its President to bring honor to the Institute of Technology, that won for him distinction at home and abroad and the respect and praise of his associates. These qualities we cannot encompass and enumerate. But we can feel them and be glad for his life, and in his writings find ever an inspiration.

WM. HERBERT KING, '94.

STANDARD POLYPHASE APPARATUS AND SYSTEMS

By Maurice A. Oudin, M.S. pp. 242. Illustrated. New York, D. Van Nostrand Company, 1899.

This volume is a description of apparatus and methods, chiefly American, employed in electric power transmission plants constructed along the lines now considered as representing the best practice. After an introduction containing definitions of the terms used in alternating current working, the twelve following chapters deal with the various types of generators, induction and synchronous motors, rotary and static transformers, station and line equipment, the description and comparison of the different polyphase systems, and the choice of frequency. The final chapter is devoted to the calculation of transmission lines.

The book is intended primarily for electrical engineers, and will be warmly welcomed by them as a valuable addition to the accessible information — at present all too scanty — on a subject of rapidly increasing industrial importance. A considerable part of it is taken from the circulars of the manufacturers of polyphase apparatus; but this rather increases than lessens its value, as the author's aim is to describe existing methods and not to write a treatise on the theory of power transmission. The result is a large amount of useful information in a compact and readable form. Space limitations, apparently, have compressed the discussion of the parallel running of alternators into a few amplifications of the statement that the machines should have a moderate amount of armature inductance: everything else is left to the reader to supply. In considering regulation, no mention is made of the protection which a lagging current affords to an alternator in case of short circuit. If the design of the machine does not permit a flow of more than three or four times the normal amount, in case of accident an element of safety is introduced into the operation of large units which cannot be ignored and which is worth some sacrifice in closeness of regulation.

The chapters on motors are well and concisely written, and the

unsatisfactory condition of the lightning-arrester problem is noted in the discussion of line equipment. The subject of resonance is of increasing practical importance, and merits a fuller discussion. It should also be noted that the power factors used in the calculation of transmission lines are considerably higher than those obtained in general practice.

The book is well printed and the illustrations excellent. A good index adds noticeably to its value. L. D.

TECHNIQUE, 1901

The editors of *Technique*, 1901, are to be credited with a most graceful act in dedicating their volume to Dr. Runkle, whom everybody loves. Not content with this alone, they have devoted the earlier pages to an appreciative review of President Runkle's administration, covering the years which marked the development of the laboratories as important instruments of instruction, the years in which it was first determined that the Institute should remain an independent educational factor, the years of financial stress and harrowing worry, and yet the years in which were successfully laid down the lines of action which have served to make the Institute what it is. During this period the work was made ready for the broadening and refining influences of his successors, whose labors have often appeared more productive than the heroic efforts of the earlier days, which, however, not merely saved the ship, but put her on the course where she was to encounter under able handling the pleasant breezes of prosperity. Incidentally, this dedicatory article furnishes the opportunity for a very interesting account of the earlier years of the Institute, when the exercises were held in the Mercantile Library Building on Summer Street and in rooms of a residence on Chauncy Street, and after this of the occupation of the Rogers Building, the construction of the first gymnasium, the "Annex," or one-story building first used for the School of Mechanic Arts as well as for the first biological laboratory.

All this and more of similar tenor give much of permanent value

to the 1901 *Technique*, and this is most certainly true of the very satisfactory and splendidly executed portrait of Dr. Runkle which faces the dedicatory inscription. In general, in its make-up and execution, this number maintains the high standard which we have become accustomed to look for in *Technique*. The most pretentious of the literary features, "Arlo's Inferno," meets with a favorable reception. The quality of the "grinds" shows definite improvement. The board of editors is to be congratulated, and emphatically commended, for so nearly accomplishing the difficult task of suppressing those supposed grinds which substitute venom for wit. The only case which we remember as furnishing a jarring note is the quotation "Egregiously an ass," ascribed to an apparently unpopular member of the Faculty, who curiously enough had never met the class of 1901. Among the novelties are the prize jokes, and also the opinions of *Technique* given by members of the Faculty, who were really interviewed, but without notice of intent to publish.

The book is dressed in Technology colors, and reflects credit on its board of editors.

SCHOOL SANITATION AND DECORATION

By Severance Burrage and Henry Turner Bailey. D. C. Heath & Co. $1.00.

In no other direction is the awakening of public sentiment of more consequence than in those problems which have to do with the expenditure of money for public schools.

The aim of the volume under discussion is to accomplish this awakening in two directions, in both of which a willingness to incur for school buildings expenses formerly considered unnecessary must be inculcated. The two topics are closely related, for physical as well as mental health is promoted by cheerful and harmonious surroundings.

It must be remembered that this book is a pioneer in a new field, and that it is written for the general public, not for specialists. So that, while it might be easy to suggest a different arrangement or a

different treatment in some cases, it is fairer to look at the general scope of the work.

The subjects considered are in part: the location and construction of school buildings; sanitary problems of the school-house; heating, ventilation, lighting, and cleaning; the school-room furniture and decoration; the responsibility of authorities for right conditions.

Some strong statements are made, not without reason, which should arouse the attention of every parent.

"Probably no country gives less attention to the careful location of schools than our own United States." p. 6.

Nevertheless, "for several years the number of new school buildings erected has been nearly 6,000 per year; and the annual increase in value of school property has been nearly $14,000,000." p. 12.

"The perfection and care of the sanitary arrangements of a school building or of any building are the measure of the civilization of the community in which the building exists." p. 68.

"The modern school-room is a workshop. It is a study. But it is also a living-room for children, extremely sensitive to impression. Therefore, it should be as beautiful as a favored home." p. 83.

"Our school-rooms are in danger of becoming 'so full of a number of things' that there will be no room for beauty." p. 94.

Such words as these will surely find good soil and bear fruit. It is not upon words only that this little volume relies. There are eighty-eight illustrations, which show more effectively the meaning of the authors.

The reviewer can bear testimony to the fact that it was not propinquity alone which led to the use of so many Indianapolis school buildings for examples. A belief in the value of education, and willingness to spend money for school purposes, are characteristic of more than one city in the Middle West. E. H.

L. II October, 1900 No. 4

THE TECHNOLOGY REVIEW

A QVARTERLY MAGAZINE RELATING TO THE MASSACHVSETTS INSTITVTE OF TECHNOLOGY

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THE TECHNOLOGY REVIEW is published four times a year: on the first day of January, April, July, and October. The annual subscription is one dollar; single copies, thirty-five cents each. Communications should be addressed to THE TECHNOLOGY REVIEW, 71 Newbury Street, Boston, Mass.

The Technology Review

VOL. II. OCTOBER, 1900 No. 4

THE BEACON OF PROGRESS

In the last number of the REVIEW (page 257) it was stated that the Paris Salon of 1900 had awarded the first medal, in the Department of Architecture, to Mr. Desiré Despradelle, Rotch Professor of Architectural Design in the Massachusetts Institute of Technology, for a monument fifteen hundred feet high, to be called "The Beacon of Progress." Since then the French government has purchased two of the smaller drawings for this monument, to be hung permanently in the National Gallery of the Luxembourg. This is a rare honor, only a few architects — among them Dubon, Labrouste, Viollet-le-Duc, and Paulet — having been thus distinguished. The REVIEW is fortunate in being able to reproduce this remarkable design, in regard to which Professor Despradelle writes as follows: —

When visiting the United States for the first time in 1893, I proceeded directly to Chicago, where I was struck by the splendor of the Exposition as well as by the marvellous energy of a people capable not only of developing material things to a superlative degree, but of an artistic manifestation of such a high order. The Universal Exposition at Chicago was not alone the first great attempt of the kind in the United States: it at the same time

showed to the Old World the aspirations of a people capable of the most daring enterprise, yet paying the utmost deference to outward beauty as the setting and ornament of civilization.

The impression of the happy effect of the White City so boldly erected on the shores of Lake Michigan haunted me. It seemed that such a manifestation should not pass without leaving some trace, and the idea of commemorating this noble initiative was born. I immediately began the study of a monument as a memorial of the Chicago Exposition. This, after some months, resolved itself into the expression of a still more comprehensive thought, one of a national character, both to fix the memory of the vanished White City and to glorify a great people. All the forces which have shaped the American nation marshalled themselves in the form of a glorious monument, the symbol of progress and grandeur. The history of Rome was inscribed upon Trajan's column: that of America should be written at the base of a column fifteen hundred feet in height, of a "Beacon of Progress," a monument typifying the apotheosis of American civilization, to be erected on the site of the World's Fair at Chicago.

The studies for this gigantic undertaking, covering a period of six years, were developed in Boston and Paris. The relative scale and environment of space were first considered in determining the proportions of the monument. This done, it was no easy task to combine the decorative elements of architecture with a colossal pyramid of such proportions; to avoid the brutality of so formidable a mass of stone in order to arrive at a result so happy that the unanimous verdict of the jury of the Salon of 1900, which awarded it the first medal in the section of architecture, should be that "it is at once noble and graceful, and the thought of glorification is clearly expressed."

All civilizations of the past have their monuments, their national manifestations, whether of religious faith or of conquests, in imperishable stone,— pyramids, temples, towers, triumphal arches, columns, and cathedrals. To America at the dawn of the twentieth contury is dedicated the " Beacon of Progress," a sort of glorious Pantheon offered as a gracious gift by a passing generation to the generations to come.

The monument is supposed to be placed on Jackson Park, the site of the World's Fair, facing Lake Michigan. It is to be connected with the principal roads and avenues of the park, the chief access being from the lakeside by a maritime boulevard. A sort of esplanade precedes the access to the principal terraces and platforms, from which can be read the different facts in American history, represented by sculptures in groups of statuary, bas-relief, etching, lettering, names of eminent men who have made the nation strong and great, a triumphal *cortège* of industries, science, arts, commerce, etc.,— in short, sculptured trophies of all descriptions. The States and Territories are represented by female figures hand in hand, symbolizing the indissoluble chain of union. Constellations of stars indicate their number.

In the place of honor, in the axis of the monument, are written the names of the thirteen original colonies; and upon the " Stela," guarded by the eagle, is the goddess of the twentieth century, the modern Minerva, flanked by ranks of lions roaring the glory of America.

At the base is a great amphitheatre, forming a sort of sanctuary where orators, philanthropists, and *savans* may deliver inspiring words before the altar of their country. In the interior, elevators conduct to different stories and balconies, as well as to the powerful beacon placed fifteen hundred feet above the ground.

In the lake itself, facing the monument on the other side of the esplanade, is to be a basin of vast dimensions for regattas, with seats for one hundred thousand persons.

A brochure will be issued, giving a more complete explanation of the monument, together with the principles of its construction and the expense.

THE LIBRARY

A few years ago it was not unusual to have some one of the older graduates come into the office of the Librarian, and remark: "You have been changing things here. This used to be the Society of Arts room." Then he might go on and speak of the wonderful enthusiasm of President Rogers, and he might relate how, when the society lacked other subject for discussion, the President would sometimes take a little stone from his pocket, and, using this as a text, deliver offhand a discourse that would hold the interest of the members of the Institute for an hour or more.

That room of so much historic interest has undergone another change. Where once stood the little glass cage, called the Librarian's office, is now the Committee Room. The partition that separated off a part of the room for the use of the Secretary is removed, and the whole is now the seat of administration. The blackboards, brought to view again by the removal of the library bookcases, have been painted over, and the transformation is complete.

Now the visitor, who, returning for the first time to view the scenes of his early struggles with "Gen. Biol." and "Comp. Anat.," in the old room at the end of the Rogers corridor, misses the familiar odor of alcoholic specimens, is

Institute of Technology.

surprised not to find himself in a maze of glass cages, and looks in vain for an imposing array of steam sterilizers, incubators, and reagent bottles.

In place of the once familiar features of the Biological Laboratory he finds a stately hall, its walls colored in subdued tints, its roof supported by Corinthian columns, its furniture of mahogany, and on all sides open shelves containing books in orderly array. This room, originally intended for the Museum of Arts, is now the General Library. Upon entering it, one finds upon the left hand shelves filled with encyclopædias, dictionaries, and other works of reference. These rest upon a tier of drawers for atlases, and the top of the atlas case forms a projecting shelf upon which the heavy books may be consulted without removing them to the tables. Beyond this is a circular desk enclosing a low opening in the wall which leads into what used to be the mineralogical laboratory, of which a part is now the Librarian's office. On the other side of the desk is the general card catalogue, containing in one alphabet the titles of all the books in the Institute arranged according to authors. If one wants to know the title of any book not to be found in the catalogue, on the adjoining shelves are printed lists of everything published within recent years in the four great book-producing countries of the world,— England, the United States, Germany, and France. Upon the shelves to the right of the door are to be found the current periodicals of a literary or popular character; and over them on a large bulletin board are pinned maps illustrating the march of current events, lists of prescribed readings, notices of public lectures, and the like. The books on Military Science are at the west end of the room, and near them a collection of the publications of the Institute, its officers and graduates; while the east

end is devoted to American, English, German, and French literature. In another place are the books on the science of language. In the galleries are kept books which are less frequently used. In one are the school and college catalogues and educational reports; and the bound volumes of periodicals are kept in the other.

But the General Library, with its seven thousand volumes, is only one of the eleven libraries of the Institute, which contain altogether over fifty thousand volumes and more than fifteen thousand pamphlets and maps.

Our system of departmental libraries is the result of a gradual growth from small beginnings. At first the heads of the various departments bought such books as they needed from time to time for purposes of instruction. In this way about eighteen thousand volumes had accumulated, when, in 1889, it became evident that more systematic attention was needed for this branch of the work; and Clement Walker Andrews, A.M., Instructor in Chemistry, was appointed Librarian of the Institute. To him was delegated the duty of purchasing all books for the Institute upon requisition of the heads of the teaching departments; and he was intrusted with the cataloguing, arrangement, and general supervision of all the libraries.

During the first decade of the existence of the Library as a distinct executive department the number of books has increased threefold. The mean annual increase for the ten years ending September 30, 1899, was 3,260 volumes.

It is needless to say that the office occupied by the Librarian and his Assistant is one of the busiest places in the Institute. Librarians may come and librarians may go, but the ebb and flow of books through this small room never ceases. Before one lot of books can be despatched to the libraries, another wave of literature is tumbled upon them.

Each book, when it arrives, is examined to see if it is one that has been ordered. If found correct, the bill is recorded and approved; and the book is entered in the record of accessions, and receives the stamp of the Institute. Then the catalogue cards are written, often several being required for a single book. These are copied, the original cards are filed in the general catalogue, and the copies are sent, with the books, to the departmental libraries. During the last few years the new books for the Physical, Chemical, and Engineering Libraries have been catalogued by the assistants in charge of these libraries. Thus a certain amount of work has been transferred from the General Library, but it still requires the supervision of the Librarian.

But this is not all. About eight hundred serial publications — dailies, weeklies, monthlies, quarterlies, and annuals — are received regularly. Each issue as it is received is recorded, and sent to the library where it is to be kept. When the volumes are completed, the separate parts are gathered together, arranged for binding, directions written and recorded, and finally sent to the binder. When the bound volumes are returned, they are examined and recorded again, the bills are approved, and the books are entered in the record of accessions, and catalogued like new books. While all this is going on, orders are being issued for new purchases; and, moreover, the Librarian is expected to keep himself informed of all that is published in English, German, and French, and to bring to the attention of heads of departments all new books that may be of interest to them.

The work of the Librarian has its pleasures and its trials. It is pleasant to instruct the gentle Freshman in the use of the Library. Generally, he asks where he can find the book that he wants. Sometimes he asks if there is "any kind of

a catalogue" by which he can find it. In any case he is referred to the general card catalogue, for a knowledge of the use of this instrument is regarded as an important part of his education. Frequently he returns with the query as to where he can find some such number as this: "12+627p. 106 il. 15 pl. O."; and his surprise and gratitude are truly delightful when he finds that, while these figures describe very accurately the number of pages, illustrations, plates, and the size of the book, the number by which he can find it upon the shelf is something quite different and very much simpler. But in the midst of the rush of work at the beginning of the term, when everything is being hastened to the utmost, it is painful to be interrupted by a young laboratory assistant with his S.B. hardly dry, who desires, with a lordly air, that this or that be hurried up. And it is still more painful to have a member of the Faculty come in, and ask, with evident expectancy of a negative answer, "Is there *any* way that you can tell whether such and such a book is in the Library?" Then, as we point to our catalogue of forty-five thousand cards, we wonder whether much of our work is of any use, after all.

The books in all the libraries of the Institute are arranged upon one system. This is the Dewey Decimal Classification, not invented by our genial professor of economics nor by the hero of Manila Bay, but by the well-known librarian of the New York State Library. It is a system that is very puzzling to the beginner, but it is quite simple when once the principle is understood. The whole realm of human knowledge is divided into ten branches. Each one of these is separated into ten divisions, which are subdivided by ten again; and so on to any degree of minuteness that one wishes. General works are given the

general numbers, and so come before the more special works on the branches of the subject. Thus 800 indicates general literature, 810 is American literature, 811 American poetry. American poetry of the middle of the present century is placed under 811.3, and the poetical works of Longfellow receive the number 811.34.

The Institute may well be proud of a library that surpasses that of any other technical school in this country, and compares favorably with those of the best technical schools of Europe. Still, we want more. We have three library funds — the Charles Lewis Flint Fund, the Rotch Architectural Library Fund, and the William Hall Kerr Fund for the purchase of books and drawings in machine design; but we have no fund for the purchase of books of a general character for the General Library. Other things as well as books are needed for this Library. The fireplaces, with their mahogany mantels, stand cold and cheerless, devoid of andirons or fender. Upon the walls we have portraits of William Johnson Walker, M.D., whose timely gift saved the Institute in the darkest hour of its infancy; of Richard Perkins, whose fund enables many a student to gain an education that would be impossible without this help. We have a bust of Albion K. P. Welch, who gave the most useful kind of a fund, one "for general purposes"; and we have that magnificent King Arthur that General Walker used to admire so much as an expression of perfect chivalry. But there are many vacant places upon the walls and bookcases which should be filled with pictures and busts. Especially we should have a portrait of Henry L. Pierce, whose generous legacy made it possible to move the Biological Department to more commodious quarters, and gave us this room for a General Library.

ROBERT PAYNE BIGELOW.

THE NEW PRESIDENT TO THE NEW STUDENTS

RÉSUMÉ OF PRESIDENT PRITCHETT'S ADDRESS TO THE CLASS OF 1904, SEPT. 26, 1900

I am sure that you can scarcely understand the pleasure which I have in assuming once more direct relations with students, and especially with students who have in view a definite and earnest purpose.

I am here at this time not to give any formal advice. In fact, I am rather of the opinion that formal advice has far more influence with the man who gives it than with the man for whom it is prepared. I am here most of all simply to meet you, to look into your faces, and to say that the Institute welcomes you to her doors and to her activities.

One of the important things for one to settle at the beginning of such a Course of Study as that which you are about to take up is definiteness of aim and purpose. It is important for you to know something about what you are doing, in order that your steps may lead somewhither. A path entered upon at random and having no end in view is apt to be circuitous and difficult.

I was influenced by certain definite considerations in coming to the Institute.

Among the considerations which influenced me was my belief in the growing importance of engineering education. To my thinking there has never been a time when the training of competent engineers was more important or when the outlook for the well-trained engineer was so encouraging. You enter your studies in preparation for

the work of an engineer at a most promising time, and the next quarter-century is to be pre-eminently the engineer's age.

Another consideration which influenced me in coming to the Institute of Technology was the high ideal which the Institute has always maintained and the skill and the devotion which its Faculty has always shown. These considerations had weight, I am sure, with you as well.

A third consideration which weighed with me, and most strongly, was my feeling concerning the spirit of the student body itself, so far as I know it. It is a great inspiration to feel that you come here with serious purpose and a real spirit of work, that you are here to do a man's work and to do it in a man's fashion, and that in dealing with you I am to deal with you as men who know their own minds, and have begun, in an energetic way, the work of their lives. I am glad to know you as men.

On your part, I judge that you have come here with the purpose to acquire a training which shall fit you to be engineers later. And, in using the term "engineer," I use it in the broad sense of one who employs scientific methods to the solution of practical problems.

In this purpose, and in the pursuit of this object, let me add one suggestion.

The engineer is becoming every day more and more an executive. The trained man is coming to direct, in constantly increasing ratio, the labors of the untrained or of the poorly trained man. As an executive, it is the business of the engineer to obtain from men under him — men of varied qualifications and imperfections — the results sought. To bring out good results with imperfect subordinates and imperfect means is the end of good administration. Any sort of administration would succeed with perfect men.

The problem which the engineer has to face is that of bringing out his results with imperfect men and imperfect means.

To attain this end,— to be able to take men with their prejudices and with their imperfections, and still achieve results,— it is necessary to take into account the point of view of others; to understand, to some extent, not only the wishes, but the weaknesses of men; and, taking these into account, to deal with them in such a way as to bring out good results.

There is a saying of Confucius that the wise men who wished, in the olden time, to govern well the empire, first sought to govern well their own states; in order to govern well their own states, they first regulated their own families; to regulate their own families, they first put in order their own persons; and to bring into order their own persons, they sought first to rectify their own hearts. And so it is that the governing of an empire begins in an examination of one's own motives.

In the same way, let me say to you that, in seeking to become engineers, see to it that you are, first of all, men; and, in seeking to become men, cultivate that form of manliness which takes into account the point of view, the rights and even the prejudices of others with whom you have to do. That form of unselfishness which takes account of the rights of others is the best means of removing the friction of every-day life.

In conclusion, let me say that I am here to help you if I can do so. I desire to know you and to make your acquaintance; and I need your help as much as you can possibly need mine. I shall be glad to have you come to me as freely as you will. My office will stand open much of the time,— I believe in the open-door policy. Whenever you wish to consult me in regard to any subject, do not hesitate to come.

We are working here, all of us, for a common end. I feel that we shall attain that end all the better by a more intimate knowledge of each other and of the purposes of the other. Furthermore, I feel sure that, in knowing each other better,— both students and Faculty,— we shall not only do better work in the preparation for engineering, but also shall progress toward a better and stronger and higher manhood.

SUMMER SCHOOLS, 1900

MINING ENGINEERING

These summer schools, which were initiated by President Runkle in 1871, have been held nearly every season since that date. The summer school tends to influence students in two ways,— to excite their interest and to widen their experience.

To excite their interest.— Students may be divided for purposes of this discussion into two classes: (1) the interested workers, who come to college because they want that which the college has to give; and (2) the indifferent, who come to please their friends. Any line of policy which will make more efficient the work of the first class is to be commended. But if, at the same time, it will go further and promote some of the second class to the first it is still more to be commended.

We are interested in what we have seen.— If we visit a magnetic concentration plant, following through the course of the ore to see with what care the crushing apparatus is chosen to avoid making too much fine dust, and the magnetic apparatus is chosen to eliminate at the earliest moment the greatest amount of waste material, to set one side a middlings product for recovering the grains of magnetite that are still attached to quartz, and, finally, to save the magnetic mineral as free from quartz as possible, we can hardly fail to become interested in the plant.

We learn easily and study with zest that in which we are interested.— The magnetic plant, as a result of our visit, assumes a new place in our world. It has ceased to be an abstract something and has become a concrete reality, about which we know a good deal and want to know more. Our interest is thoroughly aroused. Moreover, there is a fellowship among students with

Group of Mining Engineering Students, Dover, N.J.

more or less momentum accompanying it, the indifferent minority being drawn into the current and some of them permanently joining the strongly interested workers, with great advantage to the former and no disadvantage to the latter.

To widen experience.— This is in many cases the first visit the student has made to works; and, therefore, the first time he has seen the machines about which he has been studying. It is to be followed by many other such visits all through his life; but, since his experience at this stage along these lines is practically *nil*, he

will make a greater step in gaining experience than he is ever again to make in his life.

The summer school of Mining Engineering of 1900, including some of the students of the second, third, and fourth years, who were able to avail themselves of it, accompanied by three volunteer instructors, visited New Jersey and Eastern Pennsylvania. The

Mixing Concrete for Walls of Buildings, Coplay, Pa.

methods of laying out the work, of excavating, hoisting, pumping, and ventilating, were studied in two magnetic iron mines, the Richards mine and the Andover mine, and in one large coal mine, the Mahanoy City colliery. The method of dressing anthracite coal was also studied at this colliery. The methods of magnetic concentration were studied at Hibernia and at Edison, and of mining and dressing brown hematite at Ironton. The method of making hydraulic cement was well illustrated by five large works at Coplay, where this comparatively new industry is making enor-

mous strides. A fine opportunity to study the zinc oxide and spelter furnaces was given by the New Jersey Zinc Company. The iron blast furnace of the Thomas Iron Company illustrated the methods of iron smelting. A special train furnished by the Thomas Iron Company greatly facilitated the visits around Coplay and Ironton. At the Bethlehem Steel Company the students had

Folded Strata near Hokendauqua.

an excellent chance to see the open hearth steel furnace and the making of built-up guns.

The writer wishes to express his deep sense of obligation to the owners and managers of works for the kindly way in which they opened their works to the students, but especially for the interest they took in helping the students to make the most of their visit.

ROBERT H. RICHARDS, '68

CIVIL ENGINEERING

Of the hosts of people who have been to New Hampshire this summer for a few weeks' outing, to enjoy the bracing air and the beautiful scenery, there are few who bring home pleasanter memories than do those who went with the little summer school party from "Tech." While the main object of the summer school in topography is business rather than pleasure, there is always a generous share of both; and this year was no exception to the rule.

While looking for a suitable place for the school this year, we were attracted, by rumors of good hotels and by recollections of former travels, to the shores of Lake Sunapee. An examination of the country in April showed that we had found the right spot. There were opportunities for the various kinds of work and ample hotel accommodations. We decided to make our headquarters at Burkehaven, a sheltered nook on the west shore of the lake, not very far from Sunapee village.

By the 6th of June all preparations were made, and we boarded the train for the "Lake Station." Everything had started well, and promised a pleasant school.

It was a hot and dusty day; and the change from the train to the little lake steamer, "Lady Woodsum," was welcomed by all. It was a beautiful sail up the lake, and came to an end all too soon. We were met at the landing by our host, who led us up a pleasant wood path to the hotel. We spent the evening getting settled in our new quarters and in looking at the charming scenery from the piazza. During the evening the bulletin board was put up, and the assignments for next day's work posted.

Early next morning four parties left the hotel. Two levelling parties, under Messrs. Delano and Russell, were to run lines of levels from the railroad up to a point where we intended to measure our base line. The third party looked along the river for a gauging station, while the fourth went hunting for triangulation points. The latter party took a ten-mile tramp in the forenoon to get into training for what was to follow, and, as a result, had a triangulation scheme laid out and a tremendous appetite for dinner.

In the afternoon one section of the party, under Mr. Thurber, measured a base line in a low, flat meadow below the village.

Road Traversing with Plane-table.

The remainder of the party built signals on the summits of the surrounding hills. Following our custom of naming signals for members of the party, "Briggs's Signal," "Lange's Signal," and "Pete's Peak" were duly recorded, and will go down to posterity on our plane-table sheets. The work of measuring angles and

levelling was pushed along rapidly, and we soon had our scheme computed and plotted on the plane-table sheets. The framework of the survey was completed.

On Monday morning the first plane-table sheet was in the field, and the work of making the map actually begun. Soon other parties were sent out, and it was not long before a plane-table

Taking Soundings in Sunapee Harbor.

party was a common sight in Sunapee. Meanwhile Mr. Sweet and his party were gauging the river at a point below the village with every kind of meter and float ever invented. The work was now well under way. We all worked hard, and enjoyed it. The weather was very considerate indeed, and allowed our work to progress finely. When a rainy day came, we went down to the harbor and made soundings from a boat, locating them by two sextant angles between signals on shore. When the weather was clear, we continued the map-work with industry.

The work had not been going on long before it was learned that there was a baseball team in the village, and arrangements were soon made for a game with the "Techs." After this the evenings were devoted principally to practice for the game.

In order to make our work complete, it was necessary that our system of triangulation should be connected with some line estab-

On the Summit of Mount Kearsarge.

lished by the United States Coast Survey. Consequently, it was decided to send one party to Mount Kearsarge and another to Mount Sunapee, while a third should remain at Burkehaven Hill. The angles of this triangle were to be observed, the pointings to be made on "heliotrope" light. We had no regular "heliotropes"; but, by the aid of a village carpenter, we very soon had a number of them which served our purpose admirably. We supplied ourselves with axes, cameras, "heliotropes," and lunches, and sailed

down the lake. At the station the Kearsarge party took the train, while the Sunapee party drove in a farm-wagon to the foot of the mountain. The ascent was not easy; for there was no path whatever, and fallen trees and thick underbrush made it rough climbing. All parties reached the summit at about the time appointed, and the angles were successfully observed. Every one returned satisfied with his mountain trip, which made a pleasant change from the regular work of plane-tabling.

One evening the little steamer brought to us Professor Barton, who was to be with us a few days, and who made several geological excursions with small parties. On these trips each man found he had need of all his previous training in mountain-climbing. The geology of Sunapee was pronounced monotonous, but farther south a region was found where a day's trip was well worth taking.

The map-work continued steadily, and toward the end of the third week it looked as though we should complete about a square mile of country. Some places were so thickly wooded that the plane-table was of little use, and the "transit-and-stadia" method had to be used instead. Meanwhile the Sugar River had been completely measured. The hydraulics party was now on the lake, rating the meters. This was done by moving the meters through still water at a known speed, the reverse operation of measuring a current. Every part of the work was so far along that there was now no doubt that the usual amount of work would be accomplished this year. The end was near, and each began to make his plans for the vacation.

On Saturday afternoon, the 23d, the ball game, so long looked forward to, was to be played at Newport. Immediately after lunch the coach and four appeared. After decorating it with red and gray, the merry party drove off, blowing horns and cheering, ready to beat or to be beaten, but bound to have a good time. They returned badly beaten, but not a whit cast down, and earned for themselves the name of "taking it well."

Sunday evening, upon the kind invitation of the village people, we went to the little chapel near by (which had not been opened before), and sang gospel hymns. And here we ought to say that

during our three weeks there no one could have done more to make our whole stay enjoyable than did these people at Burkehaven.

GEORGE L. HOSMER, '99.

Porch to Rufus Greene Estate, Providence, R.I.

ARCHITECTURE

Following the precedent established in 1894, the summer work of the architectural students consisted this year of a detailed study of old colonial buildings. At first it was intended to examine buildings within a short radius of Boston, using the Institute draw-

ing-rooms for all the indoor work that might be required. Preparatory visits, however, limited the places to be examined, and encouraged the belief that careful studies in one locality would give better results and prove far more satisfactory than a large number of poorly drawn examples. Therefore, after a preliminary talk in he department lecture-room, the class of eleven students invaded

South Door, First Baptist Church, Providence, R.I.

King's Chapel, and began to measure the fine columns and details of its famous interior.

In this quiet place the necessary drill in the new work was given; and each student learned to appreciate the value of a systematic plotting of lines and measurements, so that the whole could be successfully drawn out at a later time. Although perched upon ladder and steps, with note-book, rule, and lead in hand, the time went quickly by until the darkness following the setting of the sun behind the adjoining high buildings suggested the brushing of clothes

and the washing up for the day. Later visits completed this interior, and we were much gratified to find that our drawings showed that many errors had been allowed in the published drawings of this building.

The next morning the class took an early train, each student abundantly equipped with drawing boards and instruments, tapes,

House Door, No. 9 William Street, Providence, R.I.

two-foot rules, lead strips, and all the tools of the trade required for a ten days' architectural tour among the quaint doorways and excellent details of the colonial houses and churches of Providence. Thanks to the courtesy of the officers of the Rhode Island School of Design, we obtained an excellent room as a rendezvous, and soon were comfortably established in cool quarters, well adapted for our day or evening work.

Then began the detailed study of that stately old building, the First Baptist Church, beautifully placed among fine trees on the

steep hillside just above the former business section of the town. Though erected in 1775, the church is still in excellent condition. We were soon busily swarming over its white porches, columns, and spire, to the edification of the passers-by, and incidentally to our own great benefit. As the building has never been measured, and its detail is in the main refined and well worth drawing, we were particularly careful to make a conscientious study of its nicely proportioned mouldings.

Gang of Students at Newburyport.

The spire is remarkably dignified and effective; and we were much interested to find that it was built from an alternative design by James Gibbs for the spire of St. Martins-in-the-Fields in Trafalgar Square, London. From a book of Gibbs' designs in Mr. Alfred Stone's office we could easily compare the design and spire, and found only a few changes at the square base. Indeed, we owed this and many other bits of information to Mr. Stone's kindness; and I am happy to say that the success of our work was mainly due to his unfailing interest and courtesy.

During the days and evenings of our ten days' visit, many Providence doorways were transferred to paper; and our rough sketches, scale drawings, and photographs form a very valuable collection of

colonial details from a section of New England that thus far has never been studied in this way. Our Salem and Portsmouth drawings made in '94 and '95 will shortly be published in the "Georgian Period." This summer's studies will also help along the good work by preserving for published form many designs executed in wood, that will sooner or later disappear through neglect or decay, through fire, or changes demanded by city improvements.

Among many of the Providence buildings that might be men-

House on Road to Ipswich.

tioned, the interior of the Unitarian church, with its fine pulpit, the simple yet dignified doorways of Angel, George, William, and Arnold Streets, the curious plan of the twin houses, yards, and outbuildings of the Rufus Greene estate, or the generous house and grounds of the Edward Carrington mansion, afford unusual opportunities for the student of colonial buildings. Yet much remains undone, for our time was not sufficient for an exhaustive study. With a large amount of material in hand, we returned to Boston, and spent the remaining days in accurately drawing out the sketches and rough studies. This work was necessarily slow and confining; but the routine was broken by a bicycle trip through the old towns of Wayland, Concord, and Lexington, where many small photographs and a few drawings were made.

Our real outing, however, was found during the hours spent in the clear sunlight of a perfect summer day on the old turnpike between Newburyport and the Parker River. Stopping many times to sketch and photograph old houses, shaded by grand elms in good New England fashion, we reached the river in time for a somewhat questionable fish dinner. The long siesta that followed was enlivened by Clark's vain attempt to sail against the outgoing tide, and by the exciting races of the horseshoe crabs, until in the cooler temperature we wheeled back to sketch the picturesque Garrison House, then on to the Chain Bridge over the Merrimack, and so back to town again.

After visiting the large schooner building on the river bank, a picnic lunch was purchased, a sail-boat chartered, and supper and the cool evening enjoyed on the waters of the harbor. With only a light breeze to work home against, there was plenty of time for stories, songs, and that delicious laziness only to be found on the water. So, later on, we hunted up beds in town, and the Summer School of 1900 was ended. To be sure, a few drawings were completed, negatives developed, and odds and ends picked up during the following days. The three weeks of attractive work and good fellowship proved to be instructive and enjoyable, and, it is assured, will be of greater architectural importance than was at first anticipated.

E. B. Homer, '85.

EDITORIALS

To acquire a proper conception of the breadth of the Institute's sphere of influence, one must perforce travel; and, if any Tech man should contemplate an extensive tour through the country, and should feel in any way anxious about the safety of railroad travel, he might reassure himself by starting on the Boston & Albany, of which Shepard, '72, is chief engineer. On reaching Albany, he could then make his way either to New York City or to Buffalo by way of the New York Central, whose superintendent of motive power and rolling stock is Waitt, '79. From New York City the Erie would be available to Rochester, Buffalo, Cleveland, and to within less than three hundred miles of Chicago; for on this road Baldwin, '84, is shown by the last catalogue to be engineer of maintenance of way. Pittsburg is easily reached either from the New York Central or the Erie by means of the Buffalo, Rochester & Pittsburg, Hoyt, '68, being chief engineer. Probably the best route from Buffalo to Chicago is via the Lake Shore & Michigan Southern Railway, with its flat grades of sixteen feet to the mile; and here we find that Handy, '75, is now chief engineer. This railroad is especially desirable from the Tech standpoint, as the three preceding chief engineers were Kimball, '73, Osgood, '78, and Hardy, '70. An alternative route, of course, would be the other Vanderbilt line,— the New York, Chicago & St. Louis, of which Johnston, '73, is general superintendent. Starting at Cleveland, it is possible closely to approach any city in the Middle West by the "Big Four," of which Kittredge, '77, is chief engineer. This definitely connects Cleveland, Columbus, Cincinnati, Indianapolis, St. Louis, and Chicago, and penetrates south as far as Cairo and west to Peoria.

From St. Louis, Louisville is readily reached by the Louisville, Evansville & St. Louis Consolidated Railroad, with Holbrook, '74, as chief engineer. Pretty much all of Michigan is available from the Lake Shore at Toledo by the Père Marquette, of which

Kimball, '73, is now chief engineer; and this line also takes in Milwaukee by means of its car ferry lines.

The Chicago Great Western, which connects Chicago, Kansas City, and St. Paul, is also an excellent Tech line, having as it does for general manager Stickney, '86; for general superintendent, Lyon, '85; and for master mechanic, Van Alstine, '86. This, however, is hardly direct enough to be very popular for passenger travel from Chicago to Kansas City. Most of us would prefer to travel between Chicago, Kansas City, and St. Louis by the Chicago & Alton, Felton, '73, president.

The gap, if there is any, from the Chicago Great Western near Kansas City or St. Jo to the Burlington & Missouri River in Nebraska is in any case small; and here we find as chief engineer Weeks, '71, whose road extends west to Denver and Cheyenne, and likewise pushes northerly into the Black Hills, or, in fact, beyond that to Billings, Mont., on the Northern Pacific, which is so close to Livingston, the headquarters of Division Superintendent Horn, '88, that it is, no doubt, on his division of the Northern Pacific. Beyond Horn's division, for the rest of the way to the Pacific, one would have to be reconciled to taking his life in his hands, away from Institute influences; but the traveller around the world would find awaiting him in Japan, Hongma, '74, president of the Sobu Railroad, director of the Tobu Railway, and consulting engineer of the Hokuyetsu Railway. Intending travellers to Japan will do well to make a mental note of his address in Tokio, — 2 Kabutocho Nihonbashiku.

Some of these railroads have only recently come under Tech control in civil or in mechanical engineering. On the other hand, only two or three years ago a favorable opportunity to reach Virginia and part of North Carolina, starting from Columbus, would have been furnished by the Norfolk & Western, of which Soule, '72, was then superintendent of motive power.

Enough has been said, however, to show how it happens that the good reputation of the Institute is not confined to any section of

the United States, and, further, that it has been made not by its graduates alone; for several of those mentioned above took special courses only, and so are not graduates.

Just at this time when we are specially aware that "presidents come and presidents go, but Tech goes on forever," a word of reminiscence of President Rogers may be fitting, from one who esteems it a bit of ill fortune that no opportunity was given him to experience the magic of his eloquence as a lecturer. Even of his address of welcome to the entering class, little lingers in the memory. But it seems as yesterday (though more than thirty years ago) that he told us, "You now stand upon the pedestal of the Young Gentleman,—you are school-boys no longer," and thus early in the Institute's history sounded the keynote with which later usage has been in full harmony, so that, with no formulated rules for behavior, suspension is an unknown penalty, and expulsion rare, while the standard of conduct excites the admiration of those interested in kindred educational institutions. General Walker's "place for men to work, and not for boys to play," of a later date, is of the same order; and both serve as indices of the fact that the Institute's habit is to appeal to the manly side of its students, that it serves to develop virile force in the training of young men, as Rogers demanded it morally and Walker mentally. For a later generation is reserved the opportunity (why not duty?) of first furnishing proper facilities, and then demanding that all students shall become physically strong, just as Rogers and Walker formulated the necessity for moral and mental strength.

It had been hoped that in this number of the REVIEW would appear memorials of two men who, in quite different ways, contributed in extraordinary measure, nor only to the right development of the Institute, but also to the infusion of its atmosphere with a manly spirit of honorable achievement. These men were

Augustus Lowell, of the Corporation, and Silas W. Holman, of the Faculty. The summer season being one, however, in which it is difficult to gather materials for such memorials, these articles have been postponed, of necessity, until the January issue. In that number Mr. Thornton K. Lothrop, his lifelong friend, will write upon Mr. Lowell; and Mr. John R. Freeman, his classmate, will write upon Professor Holman.

Mr. Lowell, burdened as he was by heavy business cares and by the exacting duties incident not only to the immense Lowell Trust, of which he was sole trustee, but to many other works of philanthropy and education, found time, nevertheless, to give much thought and energy to the development of the Massachusetts Institute of Technology. As a member of its Executive Committee, and as chairman or member of several other important sub-committees, he was called upon to deal frequently and fully with many serious questions of policy and of finance. With the zeal and self-forgetfulness characteristic of the typical Boston merchant, he gave to all these questions an attention as careful and an expenditure of time as great as though they had been weighty personal affairs. Holding great wealth, he felt that its possession gave him, not additional privileges, but, on the contrary, extraordinary duties toward the Commonwealth and the city,— duties which his native qualities and his wide experience gave him unusual power in fulfilling.

The career of Professor Holman is a striking illustration of the force of personality, of the immense significance of the individual. Although for a number of years before his lamented death it was impossible for him even to leave his house, he was still a leading and a beneficent force in the work of the Massachusetts Institute of Technology. His painful illness and his remoteness from active life seemed in no degree to diminish his interest in the work of the college to which while in health he had contributed so much. On the contrary, the fact that by necessity he was kept aloof from the details of daily routine seemed but to give him a clearer vision of

the larger work of the Institute,— of the still greater achievements which lie within its future.

Absolutely upright, but never austere; singularly sympathetic with young men, but never unwisely lenient; industrious to a marvel, yet fully appreciative of wholesome recreation; patient, exact, clear in his explanations, able to see things from a student's standpoint, knowing how and how far to throw young men upon their own resources,— Professor Holman was a rare teacher, in the ordinary sense of the word. He was still more rare, however, in his appreciation of the true significance of teaching; for he was acutely conscious of the obligation under which the real teacher stands to do much more than to impart information. He felt that he must also inspire in his students high ideals of life, aspirations for real usefulness, enthusiasm to do what they have to do with their whole heart and soul. And, because he felt and fulfilled this duty as a teacher; because, too, he believed in the Institute of Technology, not simply as a great economic, but as a still greater moral force in the community,— his house, after he had been obliged to absent himself from the class-room and the laboratory, was a place of pilgrimage for his colleagues and his students (past and present), to seek there sound advice, to be raised to his high plane of thought and ambition for the Institute, to get new courage for the work of life.

And this has been mainly the cause of the Institute's success: first, that it has had from the beginning men like Mr. Lowell and Professor Holman working for it and believing in it; second, that the subjects of study with which chiefly it is concerned must be taught to individuals face to face in groups of half a dozen, or shoulder to shoulder beside the laboratory table or machine. And, wrangle as men may — and men will until the end of time — over the value of this study or of that, over "content" and "correlation," over "bread-and-butter use" and "culture use," the man

source and foundation of all real education in college and out of college is the direct personal influence of older upon younger men.

The ratio of teachers to pupils is, therefore, a matter of very serious importance. If it be small, then follows, as an absolute necessity, the lecture system, stimulating to a few students, ineffective with the majority, unless supplemented by personal teaching of some kind and in considerable measure. And the lecture system demands a curriculum made up of subjects that readily lend themselves to teaching by wholesale. As note-taking is not "doing" in the educative sense, and as the influence of a lecturer, however distinguished, is in no degree comparable with that of a teacher who meets each individual pupil face to face, both colleges and schools are steadily diminishing the number of pupils to a teacher, to the end that the instructor may know his students as men, and not simply as masks in a sea of faces. But mere number in the matter of teachers is, of course, not enough. If young men are to be brought in small groups under the influence of older men (call them professors, instructors, teachers, or what you will), it is infinitely more important that those older men should be real teachers than if they are to meet the students only in great bodies in the lecture-room. The choice of even a new laboratory assistant may lead, then, in a modern college — especially in a college like the Institute of Technology — to ultimate success or failure; and the phenomenal career of the Institute has been due, in an astonishing measure, to the fitness, as real teachers, of the members of its instructing staff.

So obvious and so true is this that it is still the habit in some quarters to sneer at the apparatus, the machinery, what one may call the tools of instruction, in a college, as so secondary to the men who teach as to be really of no account. But that is an error as great as the opposite one of subordinating the man to the machine. We have been told to the point of weariness about

"the man behind the gun"; but, even though that man be a Yankee of the best type, he can do little execution in modern warfare unless the gun be of modern type and of perfect mechanism. It takes both the "man" and the "gun" to accomplish anything in a battle of to-day; and no modern college can afford to economize either in its teaching staff or in the apparatus (be it books or machines) with which they are to teach. The danger in the classical college is that the great teacher should not be given the best tools and methods with which to teach. The danger in the college of science is that there may be a too liberal furnishing of apparatus and of other aids to instruction without due attention being given to the men who are to teach. To steer between these dangers requires wisdom, foresight, breadth, and courage.

The following paragraph is taken from the Boston *Transcript* of Sept. 4, 1900: —

The secret of the methods of Lord Russell, England's late chief justice, as told by the chief justice himself, was the following: "If you ask me," he said, "to reduce the common habit of my life to a formula, I will tell you that I have only four ways of preparing my work. First, to do one thing at a time, whether it is reading a brief or eating oysters, concentrating what faculties I am endowed with upon whatever I am doing at the moment; secondly, when dealing with complicated facts, to arrange the narrative of events in the order of dates,—a simple rule not always acted upon, but which enables you to unravel the most complicated story and to see the relation of one set of facts to other facts. My third rule is never to trouble about authorities or case law, supposed to bear upon a particular question, until I have accurately and definitely ascertained the precise facts. The last rule is one which the professional man will appreciate better, perhaps, than the layman. It is not only valuable,— I may say this, as I did not invent it,— but very interesting to me individually, as I got it from Lord Westbury, when a young hand at the bar and pleading before him.

I was plunging into citation of cases, when he very good-naturedly pulled me up, and said, 'Mr. Russell, don't trouble yourself with authorities until we have ascertained with precision the facts, and then we shall probably find that a number of authorities which seem to bear some relation to the question have really nothing important to do with it.' My fourth rule is to try to apply the judicial faculty to your own case, in order to determine what are its strong and weak points, and in order to settle in your own mind what is the real turning-point in the case. This method enables you to discard irrelevant topics, and to mass your strength on the point on which the case hinges."

If some enthusiastic graduate of the Institute were called upon to formulate reasons why the engineering education should be recognized as the most effective preliminary training for the prospective law student who is to become later a practitioner, it would be indeed a marvel if he succeeded in setting up as strong a case for the technical training as is stated in the unprejudiced statement of Lord Russell himself. Touching his first rule, the subjects forming the backbone of an engineering course are in their nature such as to require concentrated attention upon definite and specific points; and the methods of instruction in common use are naturally directed to this end. The recitation in mathematics, the problem solved in class, the informal and the formal examination alike demand concentration of mind upon the special principle involved. A general idea of the subject, loosely held, is of little account in Institute work, as so many have discovered to their sorrow.

As to the third rule, it is the special province of applied science to deal with ascertained facts and to apply the established laws of nature to these, very much as the lawyer applies the rules of municipal or other law to the facts found to exist in the cases with which he has to deal. The engineering student must necessarily

be trained to apply laws (often mathematical) to facts, and it is just this training in applying laws to facts which Lord Russell found so necessary for the lawyer. The student trained in engineering science has learned to reject that theory of physical law which fails to harmonize with the facts in evidence, just as the lawyer finds that his case cannot be won by citing bushels of law having no application to the facts. Furthermore, in relation to his second rule, scientific training well-nigh of necessity demands system both in the observation and in the recording of facts; and it is doubtful if equally good preparation in this direction can be secured in any other way. The engineering product must surely regard the inter-relation of various requirements in the form of data or facts fixing the character of the structure. His fourth rule specifies the analytical quality of mind as necessary in order to determine the essential and critical points involved in the case, so that one's efforts may be economized and concentrated where the opportunity or the necessity fixes the true fighting ground. That the mathematical and engineering education develops the requisite analytical qualities goes without saying; nor can there well be a fair doubt that the scientific education and habit absolutely demand that honest striving after truth which, as a habit of mind, is virtually a synonym for the "judicial faculty" to which Lord Russell refers. The value of an education such as the Institute offers is already well established as preparation for the practice of the engineering professions. The time is nearly ripe for the public (to say nothing of our own graduates) to appreciate the engineering training as a true liberal education, and, further, as an especially good preparation for the study and practice of the law or of medicine or even for the ministry, where there is greater necessity for the exercise of the "judicial faculty" than has commonly been recognized.

EXAMPLES OF NOTABLE PUBLIC WORKS BY INSTITUTE MEN

THE STONE BRIDGE AT BELLOWS FALLS

The longest span yet built in this country for a stone arch bridge to carry a railroad is to be found in the new bridge at Bel-

lows Falls, Vt., which has two spans of one hundred and forty feet each. It replaces the old bridge built fifty years ago, which was an excellent typical specimen of the wooden construction of that time. In New England, bridge practice has been, and probably still is, on the whole favorable to steel structures. Probably the most enthusiastic advocate hereabouts of the stone arch is J. W. Rollins, Jr., '78, who was in immediate charge of the construction of this arch, on behalf of the contractors, Holbrook, Cabot & Daly, a prominent firm of which Rollins is now a member. His preference for stone arches, however, was previously evident in the work of the abolition of grade crossings at Brockton, where a number of fine arches are due, both in design and construction, to

Mr. Rollins, who was then the resident engineer in charge of work on behalf of the railroad. Earlier work on the new railroad between Walpole and Islington showed the same leaning toward the stone arch, which he has long claimed to be cheaper in cost than a steel bridge furnishing an equally good road-bed, this having been his view of the case even before the great increase in the cost of

steel. Another feature, surprising to many engineers, and which may have been a controlling consideration in the Bellows Falls Bridge, was the possibility of more expeditious construction in stone than in steel. The Brockton experience had demonstrated the possibility of rapid work; and this, no doubt, had much to do with the selection of the stone arch, as the type of bridge to be used at Bellows Falls, by the chief engineer of the Fitchburg Rail road, Mr. A. S. Cheever, to whom is due the credit for the pla· adopted, although Institute men will be pleased to know th· t·· details of the plan were worked out (under Mr. Cheever ·· · ·r

man, C. A. Wentworth. The rapidity of the work can be appreciated if it is understood that the contractors were told to go ahead with construction September 7, and began work on the ground September 13, that the first stone was laid in the northerly arch October 18, and the arch finished October 22. The southerly arch in a similar way was begun November 7, and the key placed November 10; and trains were carried on the arches November 20.

Completing the arch proper in four or five days seems an almost impossible feat, especially in view of the fact that months are sometimes consumed in similar work. It is the opinion of Mr. Rollins, however, that rapidity of arch construction is in many ways desirable. Among other things, the longer the centers stand under a partial load only, the greater is the liability to distortion.

The bridge is built to accommodate a double track, and is twenty-seven feet between faces of the side walls. It was necessary, of course, to provide means for carrying the regular traffic of the railroad; and there was no interference with this during the progress of the work.

An important feature of the construction was, of course, the

design of the centers. Aside from the ordinary features of such structures, it was here necessary, in order to provide for the flow of the river, to span a gorge of forty feet in width, the bottom of which was eighty feet below the rails. How this work was accomplished may be gathered from the illustration. An unusually dry season, with water "the lowest for years," gave excellent opportunity for desirable construction of centers.

A comparison of the levels of the water in the different illustrations will suggest the importance to the contractor of a fortunately dry season. There were some unusual features in the design of the centers, as they were built "without bolts, mortises, or tenons, reliance being placed upon plank patches, and braces thoroughly spiked for stiffness and strength."

Possibly the most pleasing part of it all, to many of us, is to be found in the fact that an able engineer, with special experience in such work, is convinced that, in very many cases, the economical structure is the stone arch, with its graceful pleasing lines, rather

than the steel structure, which is almost always unsightly, even after we have had time to grow used to it. It is further particularly fortunate when this opinion is held by a man who, in his position as a contractor, is able actually to accomplish work on that basis of economy which, as an engineer, he knows to be entirely feasible,— an important advantage, not always to be secured.

MONTGOMERY WARD & CO.'S NEW BUILDING, CHICAGO

Designed by Richard E. Schmidt, '87

This building has a very prominent location at the corner of Madison Street and Michigan Avenue, two important streets in the heart of the city; and on one side of the Lake Front Park facing Lake Michigan its outline is visible for miles above the general mass.

The owners of this building and business sell only to non-residents of Chicago. As most of these are strangers in the city, this corporation desired a structure that would be known to every one and easily found, consequently a tower was the natural sequence. They also wished that their building contain all the best of modern construction, material, and to be a credit to them and to the city.

The building proper is twelve stories high, fronting but eighty-six feet on Michigan Avenue. The proportions of the tower were studied in relation to this elevation, and resulted in a design in which the tower is the central and major motive, measuring forty feet square at the base and three hundred and ninety feet from pavement to the top of the weather-vane figure, now being modelled by J. Massey Rhind, of New York. This represents "Progress," and is to be in place in a few weeks. The structure is rich in modelled terra-cotta and marble carving, executed by prominent artists.

The three lower stories are of white Georgia marble in rusticated courses. The main entrance is through a pedimented portico, the height of the first and second stories. In the pediment is a marble fronton, modelled by Ph. Martiny, of New York, consisting of a symmetrical group of two lions and two youths each side of a large shield.

The three lower stories are designed as the base of the building, the twelfth story as the capital, and the eight intermediate stories as the shaft. The nine upper stories and the tower are all of mottled buff brick and light terra-cotta.

The panels of the tower are filled with golden tile,— *i.e.*, gold fired on terra-cotta, brightest when the sky is clouded, changing with every sky, — and is to end with the double life-size gilded copper revolving weather-vane figure.

The foundation soil being very uncertain, about 1,200 52-foot 15-inch Norway pine piles were driven to 68 feet below street grade, each to support an estimated load of 25 tons. These piles are capped with steel and concrete. The structure is of full skeleton steel, fire-proof construction. Every square foot of each floor is calculated for a live load of 300 pounds. This heavy floor load in connection with the tower loading required some very heavy columns, the largest having a cross section of 177.7 square inches in the first story, or nearly $1\frac{1}{4}$ square feet of solid steel, or 605 pounds per lineal foot of column.

The window frames of the entire building are metal. The maple floors are the only wood.

The tower contains absolutely no wood. The floors here are of colored cement, in small squares.

The mechanical plant furnishes power, light, heat, and water for three-quarters of the adjoining city square. This consists of water tube boilers, two vertical compound Allis engines, four dynamos, high duty pumps, triplex pumps, Adams patent sewage ejector, carbonic acid ice machine for cooling drinking water, circulating pumps for these, electric passenger elevators, high pressure hydraulic freight elevators, continuous chain elevators, fan system of heating and ventilating, link belt conveyors, ash conveyors, artesian well pumps, sewing-machines, etc.

[It is proposed to publish in the REVIEW, from time to time, accounts, similar to the above, of works of conspicuous interest, designed and carried out by past students of the Institute.]

GENERAL INSTITUTE NEWS

CORPORATION NOTES

The two hundred and eighty-third meeting of the Corporation was held at the Institute June 1, 1900. Appointments by the Executive Committee were confirmed, as elsewhere announced. The degree of Bachelor of Science was conferred on one hundred and seventy-eight graduates, distributed among the various departments, as noted in the July number of the REVIEW. A report, postponed from the March meeting, on the Department of Chemical Engineering, was presented; also, Dr. Pritchett's letter of acceptance of the Presidency of the Institute. But little business has been transacted by the Corporation and Faculty during the summer. The duties of the committees on entrance records, scholarships, and petitions, have not been, however, light. At the July meeting of the Scholarship Committee one hundred and eighty-four applications were examined, and recommendations made amounting to $16,600. At the September meeting the committee considered supplementary applications and one hundred and eight for the forty State scholarships. This year there were two districts presenting no applications. The income of the Billings Fund becomes available for scholarship purposes the present year.

THE INAUGURATION

In accordance with the authorization of the Executive Committee of the Corporation, Messrs. Wheeler, Wigglesworth, and Williams were appointed a sub-committee to arrange for the inauguration, and Professors Runkle, Swain, Bates, and Tyler an auxiliary Faculty Committee. Mr. Munroe was added to the Joint Committee. It has been determined that the inauguration exercises be held on Wednesday, October 24, at two o'clock, in Symphony Hall, at the corner of Huntington and Massachusetts Avenues. The programme is expected to include an invocation by Bishop

Lawrence, an inaugural address by the new President, and addresses by representatives of the National and State governments and of the Corporation and Faculty. A reception in the library in the Rogers Building will follow.

It is expected that the students will attend in a body, and that invitations will be sent to all graduates.

The occasion should be as notable a one in the history of the Institute as was the impressive meeting in memory of President Walker.

FACULTY AND INSTRUCTING STAFF

Following is a list of the changes in the Instructing Staff for the coming year, so far as now known: Associate Professor Pope has been appointed Professor of General Chemistry; Assistant Professors Vogel, Woodbridge, and Ripley have been advanced to the rank of Associate Professors; Lieutenant Hamilton will be succeeded, as Professor of Military Science, by Captain William Baird, U.S.A., retired.

Professor Webster Wells has been granted leave of absence for a year, and will make an extended tour in Europe, Egypt, and Palestine. Professor Wells's classes are for the present distributed among other members of the Mathematical Department. Dr. William H. Walker has resigned his instructorship in analytical chemistry to accept a professional engagement. Mr. Harry W. Gardner has returned, after a valuable year of European travel and study, to resume his work as instructor in architecture. Mr. Carl H. Clark, instructor in naval architecture, has been granted a year's leave of absence, and will be succeeded by Mr. Walter S. Leland, '96. Mr. Myron L. Fuller, instructor in geology, has received an important appointment in the U.S. Geological Survey. Messrs. Louis P. Chapin, Arthur A. Blanchard, and Miles S. Sherrill have gone to Leipsic for advanced studies in chemistry. Messrs. George L. Hosmer, Alpheus G. Woodman, and Joseph C. Riley, assistants of last year, become instructors. Messrs. Walter B. Russell, Francis H. Watts, Eugene W. Rutherford, Alvan L. Davis, Fred L. H. Kimball, and Etheredge Walker, assistants of last year,

are leaving the Institute for professional work. Mr. Joseph G. Coffin is to be a graduate student at Clark University. Dr. William D. Coolidge has been appointed instructor in theoretical chemistry. New assistants just appointed are R. W. Balcom in analytical chemistry, E. E. Bugbee in mining engineering, W. L. Stevens in mining engineering, L. S. Smith in mechanical engineering, C. M. Fosdick and G. E. Russell in civil engineering.

Professors Chandler, Despradelle, Sedgwick, Hofman, Bartlett, Vogel, and Sumner have spent their vacations in Europe.

PARIS AWARDS

Unofficial reports indicate that the Institute has been notably successful in the awards for its exhibit at Paris. A fuller statement will be made in the next number.

THE COURSE IN ARCHITECTURE

The following is taken from an article entitled "Architectural Education in the United States of America," in the *Journal of the Royal Institute of British Architects*, June 16, 1900 (pp. 394–397), by Arthur Cates: —

"In the late 'forties' and early 'fifties' many smart young architects went from London to the States, and there speedily attained to good and influential positions, prospering greatly. But, as London did not afford any opportunity for sound, systematic artistic education, the young American student did not come here for the instruction which he sought; but a steady stream of earnest aspirants flowed to Paris, where, in the ateliers of distinguished architects and in the École des Beaux-Arts, they found the instruction and guidance they desired.

"This special training of those who now occupy leading positions in the profession, and the developments which have followed the persistent teaching and exertions of Professor Ware, have so influenced the progress of education in the States that the student, if he has not already done so, may soon hope to find at home sources of instruction which will render the course in Paris less necessary,

and even a comparatively superfluous luxury. It has even been suggested that at no distant period the ambitious English student, who may desire to prepare himself for the effective practice of architecture and go through a complete course of technical and artistic training, may find it expedient to resort to one of the American universities, and there obtain that thorough education which sluggish indifference to educational advancement and blind adherence to the antiquated and effete system of pupilage does not afford him here."

"The recent receipt of the Annual Report for 1899 of the President and Treasurer of the Massachusetts Institute of Technology of Boston, U.S.A., and the calendar quaintly described as 'The Annual Catalogue, 1899–1900,' affords the opportunity for noting many interesting particulars concerning the course of instruction in architecture followed at the Massachusetts Institute."

A column and a half of description of the work of this course follows.

The following extracts are from circulars recently issued by the Institute: —

NEW OPTIONS OF THE COURSE IN CHEMISTRY

A new and systematic series of options has been recently introduced into the Course in Chemistry by the Faculty, with the purpose of enabling students to prepare themselves more thoroughly than has been hitherto possible for the important special lines of chemical work in which a considerable demand for the services of Institute graduates has been shown by experience to exist. These options have, however, in all cases been developed in accordance with the principle that the specialization should not be carried to such an extent as to prevent the student from acquiring a thorough training in all the important branches of chemistry, sufficient even to enable him to take a position in a line differing from that for which his option has specially prepared him. Thus the time required for the various options has been gained, not by eliminating any of the general instruction in analytical,

theoretical, industrial, or organic chemistry, but by transferring certain specialized courses now taken by all students from the list of required subjects to the appropriate options. . . .

Most of the graduates of the Course in Chemistry who occupy positions in manufacturing establishments are called upon to superintend the running of machinery and to take charge of various mechanical operations. Option I., which includes a considerable amount of instruction in mechanical engineering and drawing, is strongly recommended as furnishing an adequate preparation for students who desire to fit themselves for such positions, provided they have a sufficient aptitude for mathematics and drawing to make probable the successful completion of the work which the option requires. The courses in mechanism and valve gears (each accompanied by drawing), and the course on engines and machines, are especially adapted for the students of the Course in Chemistry, and are designed to give such a knowledge of fundamental principles as will enable them to understand the simpler forms of machinery, to interpret mechanical drawings, and to furnish an adequate foundation for further development in the same lines. It may be added that the students taking this option receive an essentially different training from that acquired by those in the Chemical Engineering Course, the former devoting by far the larger proportion of their time to chemical and the latter to mechanical engineering subjects.

Option II. comprises the laboratory courses on all the special branches of technical analysis; namely, those on water, air, and food analysis, sugar analysis, and proximate analysis, as well as courses in biology, microscopy, and geology. The option is especially of value to those who desire to fit themselves for the general practice of analytical chemistry, and for positions as chemists in such laboratories as those of railroads or manufacturing establishments. Though less satisfactory as a general preparation for the manufacturing side of chemistry than the preceding option, it may be taken by students who desire to occupy purely chemical positions.

Option III. is intended for students wishing to prepare themselves

for positions connected with the purification of water and sewage, with the examination of milk, butter, and other food supplies, with fermentation and food-preserving industries, or with other industries in which bacterial action plays an important part. About ten per cent. of the former Institute graduates in chemistry occupy such positions.

Option IV. is intended for those who desire to become chemists of metallurgical works or, after more experience, superintendents of such establishments. About ten per cent. of the Institute graduates in chemistry are now engaged in metallurgical work.

Option V. forms a complement to the Course in Physics, and is intended to meet the needs of the same class of students; namely, of those who desire to become teachers, especially in higher institutions, or to fit themselves for scientific research. It differs, however, markedly from the Course in Physics in that by far the larger portion of the work is on the chemical instead of the physical side. Nearly one-fourth of the chemical graduates are engaged in teaching or research, and for the larger proportion of these there is little doubt that this new option would have proved most satisfactory preparation.

COURSE IN ELECTRO-CHEMISTRY

The rapid advances now being made in the applications of electricity in chemical and metallurgical industries call for a training which has not hitherto been fully provided in the courses in Electrical Engineering, Physics, or Chemistry, as given at the Institute or elsewhere. The problems arising in these arts require for their solution the combined training of the physicist, the chemist, and, to a less degree, that of the engineer.

To meet the wants of students desiring to prepare themselves for entrance into the various electro-chemical industries, the Institute has decided to establish a course of study leading particularly to this end.

This Course, which has been established as an "Option" of the Course in Physics, comprehends, first, an extended consideration of electricity and electrical testing, together with those portions of

electrical engineering which are especially related to machinery employed in electro-chemical work; second, a thorough course in chemistry, including analytical, industrial, organic, and theoretical chemistry; and, third, a detailed study of the theory of electro-chemistry and its industrial applications.

The option in electro-chemistry aims to provide the education requisite for the investigation of the many new problems which the development of novel processes is certain to bring forth, and also to impart the professional skill requisite for the installation, testing, and operation of apparatus and machinery by which electrical energy is applied in chemical, metallurgical, and allied processes. The instruction given, moreover, is of such a broad character, particularly in electricity and chemistry, that a student completing this option should be well prepared to undertake various lines of electrical or chemical work other than electro-chemistry.

THE GRADUATES

THE TECHNOLOGY CLUB

Summer for the Technology Club is always more or less of a quiet season. The Institute is closed except for the few summer courses which are over by the first of August. There are fewer of the instructing staff happening in; but a number of the alumni about Boston avail themselves of the hot weather lunches which are served daintily and in a cool dining-room. At the time of the entrance examinations the candidates for examination were invited to use the dining-room of the club. Not many of them, however, accepted the invitation.

When the season of "smoke talks" begins, the members who are unable to use the club except on these evenings will see with what pains the House Committee has freshened the appearance of the whole house with paint, new wall paper, and carpets where needed. An interesting fact attached to this is that the paper and

carpet are the products of Institute men. Just as at the time of the last Presidential campaign, the election returns will be received at the club-house on the evening of election day.

Appended is a reprint of the circular mailed to club members, which contains a list of the "smoke talks" already given in the "common room."

THE TECHNOLOGY CLUB

BOSTON, June, 1900.

In the belief that many Institute men — including even members — do not appreciate how much the Technology Club does for those who use it, the following reminder of the opportunities for pleasure and profit is sent: —

A homelike house, with open fires, books, comfortable furnishings, and a charming outlook upon the Institute grounds.

Table d'hôte breakfast (7 to 9 A.M.), lunch (12 M. to 2 P.M.), and dinner (6 to 8 P.M.) every day in the week at reasonable prices. "Extras," if ordered in advance, will be served at an additional cost. To all meals, members may bring friends (subject to the usual club rules relative to guests), and on the following days may bring ladies: *Sundays* to *dinner* and *supper*, *Mondays* and *Wednesdays* to *dinner*, and *Saturdays* to *lunch* and *dinner*.

Moreover, anything from a sandwich to a substantial meal may be obtained at any hour between 7 A.M. and 11 P.M. by application to the steward. Attention in this connection is called to the fact that Welsh Rarebits will be served, upon notice to the steward, in the evening after the theatre. Special arrangements will be made with members desiring to take all their meals at the club or with groups of members wishing to lunch or dine together.

Comfortable bedrooms at moderate prices. Owing to the favorable location of the house, these are unusually cool in summer. While it is well to make application for these rooms in advance, it is generally possible to secure one without previous notice.

The standard American and foreign periodicals to the number of about fifty. Ample facilities for correspondence.

Long distance telephone; free to members within the so-called Boston Division.

A combined billiard and pool table. Billiard and pool tournaments. Opportunities for playing cards, chess, etc. Whist evenings.

Cigars, cigarettes, and "soft" drinks of all kinds on sale at all times. Smoking is allowed in all parts of the house.

A convenient, dry shed for bicycles.

Excellent facilities for the giving of class and other dinners, with bills of fare equal to those of the leading hotels.

Rooms for the holding of committee meetings on matters in any way connected with Institute affairs.

"Talks" at intervals of about two weeks during the Institute session. These talks are held generally on a fixed day of the week; and smoking is permitted, excepting at the two or three to which members are privileged to bring ladies. With rare exceptions, members may bring men guests to all these talks. They are of a high order of interest, and a majority of them are illustrated with lantern pictures (see list). A lunch is always served after the talks.

Special opportunities at the "Riverside Recreation Grounds."

Information in detail regarding the club, copies of notices, membership application blanks, etc., may be obtained at the club-house or by writing to WALTER HUMPHREYS, secretary, 71 Newbury Street, Boston, Mass.

From June 15 to September 15 the rules regarding the admission of guests are suspended, and members may bring friends, whether ladies or gentlemen, to lunch or dinner whenever they please.

LIST OF TECHNOLOGY CLUB "TALKS" AND OTHER MEETINGS, 1897 TO 1900

Those having the title in italics were illustrated by the stereopticon.

1897.

Mar. 16. Professor E. S. Morse, "*Japan and the Japanese.*"
Mar. 27. M. I. T. Glee Club.
Apr. 9. Dr. F. H. Williams, "*X-Rays.*"
Apr. 16. Reception to Hon. C. D. Wright.
Apr. 21. Reception to Juniors and their friends.
May 7. Professor W. T. Sedgwick, "*Famine and Plague in India.*"
May 14. M. I. T. Banjo and Mandolin Clubs.
May 21. Bohemian Orchestra.
Oct. 22. Reception to Class of 1898.
Oct. 29. Herbert Putnam, "Some Famous Thefts from Libraries."
Nov. 8. Reception to President Crafts.
Dec. 5. F. Marion Crawford, "The Original Mr. Isaacs."
Dec. 10. Bohemian Orchestra.
Dec. 17. Chas. W. Hubbard, "*Canoeing on English Rivers.*"

1898.

Jan. 2. String Quartette, Chamber Music.

Jan. 7. Dr. G. Byron Gordon, "*Ruins of Central America.*"

Jan. 21. W. L. Underwood, "*Birds, Annimals, and Odd New England Characters.*"

Jan. 28. Dr. E. E. Hale, "The Topography of Old Boston."

Feb. 19. Reception to ladies in honor of the Thirty-third Anniversary of the Opening of the Institute.

Mar. 2. President T. C. Mendenhall, "*Alaska.*"

Mar. 12. M. I. T. Glee Club.

Mar. 18. H. A. Miller, "*Metropolitan Water Supply.*"

Mar. 26. Subscription Concert, M. I. T. Glee, Banjo, and Mandolin Clubs.

Apr. 8. Arthur T. Hopkins, "*Jamaica.*"

Apr. 14. Hon. Carroll D. Wright, "The Workingman's Complaint against the Courts."

Sept. 26. Hiram S. Maxim, "*Inventions in Connection with Fire-arms.*"

Oct. 26. Excursion to Metropolitan Water Basin.

Oct. 27. Rev. E. G. Porter, "Evolution of the Modern Spaniard."

Nov. 5. Professor F. H. Giddings, "The Philippine Question."

Nov. 11. Paul du Chaillu, "*The African Forest.*"

Nov. 18. C. Howard Walker, "*The Trans-Mississippi Exposition.*"

Dec. 6. Prof. C. E. Fay, "*The Canadian Rockies.*"

Dec. 16. Professor J. O. Sumner, "*National Character as illustrated by Ancient Sculpture.*"

Dec. 20. Edward Gilchrist, "China and the Modern World."

1899.

Jan. 27. G. E. McQuesten, "*Japan.*"

Feb. 3. Stereopticon Pictures and Long Distance Telephone Conversation with North-western Association Alumni Banquet.

Feb. 20. Dinner to D. C. French. (Speeches by Mr. French, President Crafts, President Drown, Professor Charles Eliot Norton, and Mr. C. H. Walker.)

Mar. 3. Gen. Charles H. Taylor, "Modern Journalism."

Mar. 10. Professor A. E. Burton, "*Gruyère.*" [Ladies invited.]

Mar. 23. Professor Charles E. Munroe, "Smokeless Powder."

Mar. 31. W. L. Underwood, "*Hunting with a Camera.*"

Apr. 7. Subscription Reading by Mrs. Erving Winslow, and Concert by M. I. T. Glee, Mandolin and Banjo Clubs.

Apr. 17. Joseph Earle Stevens, "*The Philippine Islands.*"

1899.

May 5. Leonard Metcalf, "*Puerto Rico.*"

May 15. Professor S. H. Woodbridge, "The Great Lottery Fight."

Nov. 3. Howard A. Carson, "*Some Things seen by an Engineer during an Excursion in Egypt.*"

Nov. 17. Edwin S. Crandon, "Old Boston, England."

Nov. 24. Dr. Henry A. Wolff, "The Transvaal and the Present Crisis."

Dec. 7. Mrs. Mabel Loomis Todd, "*In Ainu Land with an Eclipse Expedition.*" [Ladies invited.]

1900.

Jan. 3. Professor Arlo Bates, "Anglo-Saxon Natural Science."

Jan. 19. Professor D. R. Dewey, "Visit to the George Junior Republic."

Feb. 9. Lieutenant Colonel Butler Ames, "Experiences during the Spanish War in Porto Rico."

Feb. 23. W. L. Underwood, "*Children of the Woods.*" [Ladies invited.]

Mar. 2. Colonel Curtis Guild, Jr., "Reminiscences of the Spanish War in Cuba."

Mar. 9. Louis F. Cutter, "*A Month in Tunis and Algeria.*"

Mar. 16. Gelett Burgess, "Some Essays in Enthusiastic Journalism."

Mar. 30. Professor D. P. Bartlett, "*On Horseback through the Yellowstone Park.*"

Apr. 14. Col. H. C. Cochrane, U.S.M.C., "Personal Reminiscences of the Battle of Guantanamo."

May 8. Edwin F. Atkins, "*Cuba.*"

June 5. Reception to President-elect Pritchett.

NEWS FROM THE CLASSES

1868.

PROF. R. H. RICHARDS, *Sec.*
Mass. Inst. of Technology, Boston.

Robert H. Richards is just finishing the seventh year which he has devoted to writing a book on ore-dressing. The first nineteen chapters are in the hands of the printer or are ready to go. The remaining two chapters he hopes to finish within a month. The subject has presented rather peculiar difficulties, as classification of operations can only be done to a limited extent; and, in consequence, a great number of individual operations have to be described and discussed separately. The writing of this book has absorbed so much energy that other demands of the department have had to yield to it. Professor Richards expects to be able now to devote himself to bringing up these other lines to the development they rightly claim.

1873.

SAMUEL E. TINKHAM, *Sec.*
City Hall, Boston.

Frank W. Very has been appointed special agent to the United States Weather Bureau at Rock Point, Md.

1875.

E. A. W. HAMMATT, *Sec.*
53 State Street, Boston.

Wilfred Lewis is now president and engineer of the Tabor Manufacturing Company, 18th and Hamilton Streets, Philadelphia, Pa.

1877.

RICHARD A. HALE, *Sec.*
Lawrence, Mass.

F. W. Wood is president of the Maryland Steel Company, and has been instrumental in developing the plant at Sparrow's Point, Md., to its present condition. He has various Tech. men of other classes associated with him.— E. Grover is engaged in landscape engineering at East Walpole and surrounding country.— J. E. Hardman, consulting mining engineer of Montreal, has just made a flying trip to Boston. He is contemplating opening an office in London. He has made many examinations of the Canada mines.— Herbert Jaques is

an active member of the Brookline Country Club, being connected with some of the committees, and is an expert golf player.— R. A. Hale, as chairman of the Lawrence Park Commission, is very busy with various matters pertaining to shade-trees, parks, etc., which are under the general supervision of the commission. There are in Lawrence about twenty-five Tech. men, and the subject of a branch club is being discussed.

1881.

FRANK E. CAME, *Sec.*

17 Place d'Armes Hill, Montreal, P.Q.

Frank G. Darlington has been spending the summer at Hyannisport, Cape Cod.— Dr. John Duff is recognized as one of Charlestown's leading physicians.— Governor Frank Rollins's "Home Week" was again a great success. Frank wants to be United States senator.— Of the graduates of the class, only seven remain bachelors.— Ira Abbott is at Andover, Mass., in engineering and supply business.— William R. Snead is now at Jersey City, still as general manager of the Snead Iron Works.

1882.

WALTER B. SNOW, *Sec.*

Watertown, Mass.

George F. Shepley is a member of the Board of Architects in charge of the design and construction of the buildings for the Pan-American Exposition to be held in Buffalo during the summer of 1901.— James E. Chapman, who is secretary and treasurer of the Neponset Land and Live Stock Company at Evanston, Wyo., is reported to have spent the summer in the East. His old home is at Canton, Mass.— George L. Heins has been appointed State architect of the State of New York. — George W. Mansfield is manager of the delivery department of the New England Electric Vehicle Transportation Company, Boston.— W. H. V. Rosing has been appointed to the newly created office of assistant superintendent of machinery of the Illinois Central. He was born in Cincinnati, Ohio, March 8, 1859. After leaving the Institute in May, 1880, he entered railroad service with the Illinois Central as machinist's helper at the old Weldon shops, Chicago. Ex-

cept for brief periods between 1891 and 1897, he has been with the Illinois Central until the present time. He was transferred to the draughting-room in April, 1882, and became secretary to the superintendent of machinery in September of the same year; chief draughtsman of the machinery department in January, 1884; and assistant master mechanic of the Chicago Division in April, 1890. After serving as mechanical engineer of the Grant Locomotive Works in 1892 and master mechanic of the First Division of the Denver & Rio Grande in 1894, he returned to the Illinois Central in 1897 as mechanical engineer, and took his present position on December 1 last.— Edward G. Gardiner has been this summer at the Biological Laboratory at Wood's Hole, of which he is one of the directors.— Mr. George T. Jarvis, who has been appointed general manager of the Wisconsin Central Railway, with headquarters at Milwaukee, began his railway career when sixteen years old, as an apprentice in the shops of the Pennsylvania Railroad. He next became a fireman, and then, in 1881, took a course in civil engineering at the Institute. After leaving that school, he entered the operating department of the Philadelphia & Erie Road, and gradually rose in this branch of the railway service on various lines in the United States and Mexico, until in 1896 he was appointed receiver and general manager of the Louisville, Evansville & St. Louis Road.

1884.

DR. AUGUSTUS H. GILL, *Sec.*
Mass. Inst. Technology, Boston.

Miss Laura A. Linton is resident physician in the woman's department of the Rochester (Minnesota) Insane Hospital. She taught in the Minneapolis High School until 1895, when she left to accept the position of private assistant to Professor S. F. Peckham. Her work with him consisted largely of the analysis of asphalts, the results of which were published in the *Journal of the American Chemical Society*. In 1896 she commenced her course in the medical school of the University of Minnesota, taking her M.D. last June. Much of the time there spent she served as assistant in dif-

ferent departments.— Edward V. Sedgwick, formerly with the Mexican Central Railroad, is now a travelling mechanical expert with the Galena Oil Company of Franklin, Pa. When last heard from, he was at Arequipa, Peru.— The sixteenth annual directory has just been issued by the class secretary, with interesting notes from scattered members of the class, and a memorial of George H. Heywood, who died in May, 1898. Mention is made of a gift of an oak table to the Technology Club.— H. F. Baldwin is now chief engineer of the Chicago & Alton Railway, Monadnock Building, Chicago, Ill.— Alfred L. Fitch is in the construction department of Swift & Co., Union Stock Yards, Chicago.— C. O. Prescott has returned to Milton Academy as teacher of German and chemistry.— Theodore W. Robinson is general manager of the Illinois Steel Company, Rookery Building, Chicago, Ill. — Alfred Stebbins, Jr., whose present address is 46 Columbus Street, Newton Highlands, has recently been with Mr. Arthur F. Gray, mill engineer, 53 State Street, Boston. Since his return from San Francisco in 1891, Stebbins has been in the neighborhood of Boston, and during the past summer has been doing landscape work on an estate in Cohasset.

1885.

E. B. HOMER, *Sec.*

Mass. Inst. of Technology, Boston.

The class meeting of this year was held at the Puritan Club on May 26. Twenty-two members attended. The resignation of Arthur D. Little, the class secretary for the past five years, was accepted with many regrets and with a general expression of appreciation of the good services rendered to the Institute and the class.— J. M. Kimball was elected president for ensuing year, and E. B. Homer secretary for five years.— C. H. Bartlett is at present connected with the construction department at the Charlestown Navy Yard.— W. D. Fuller is in the signal service at Los Angeles, Cal. — "Ike" Litchfield is still with the Deering Harvester Company, Chicago, and writes, among other interesting items, that in the North-western Association other classes frequently

refer to '85 as the inaugurator of the new era at the Institute. — Sidney Williams has been appointed comptroller of the Delaware Valley & Kingston Railway Company, in addition to previous duties. — Henry Williams is working out a complicated problem in chemical engineering for the United States government.— The engagement is announced of Arthur D. Little to Miss Henrietta K. Anthony, of Boston.— Wedding cards have been received from Alfred L. Fuller.

1886.

PROF. ARTHUR G. ROBBINS, *Sec.*

Mass. Inst. Technology, Boston.

William F. Jordan is assistant engineer of the New York Central & Hudson River Railroad at Grand Central Station.— Professor E. F. Miller was married, September 11, to Miss Mary W. Reed, of Lexington, Mass.— H. B. Merriam is assistant engineer for the Chicago Great Western Railway at Des Moines, Ia.—E. J. Wilson is with the British American Corporation, 61 Beekman Street, New York.

1887.

EDWARD G. THOMAS, *Sec.*

89 State Street, Boston.

Helen Cooley Palmer is professor of chemistry at the New York Medical College and Hospital for Women, as well as physician and assistant surgeon to the New York Ophthalmic Hospital.— W. S. Thompson is assistant engineer of the Pennsylvania Railroad at Oil City, Pa.— Sidney Williams is general superintendent of the Pennsylvania Coal Company, Dunmore, Pa.— George F. Sever, formerly an instructor in Columbia University, has recently been appointed superintendent of electrical exhibits, Pan-American Exposition, Buffalo, N.Y. He has made the suggestion to the officials that the classes in electrical engineering from all the colleges in this country be invited to come to the Pan-American Exposition and inspect the electrical plant, which is to be the best equipped and the most extensive of any in the world.

1888.

WILLIAM G. SNOW, *Sec.*

4 Post-office Square, Boston.

A. F. Mead has become a member of the firm of A. &

O. W. Mead & Co., commission merchants, 36 North Market Street, Boston. — Messrs. Stone & Webster suffered considerable damage from fire, August 23. They have moved temporarily to 93 Federal Street, Boston.— B. R. T. Collins, with the Chicago Edison Company, married Miss Katherine Greer of that city, June 20. They reside at 4557 Oakenwald Avenue.— G. U. G. Holman became connected, in August, with the switchboard engineering department of the General Electric Company, Schenectady, N.Y.— S. C. Hathaway, Jr., is with Hathaway, Soule & Harrington Corporation, New Bedford, Mass.— Arthur W. Jones is manager of the Australian Electric Company in Melbourne.— Ivar L. Sjöström is treasurer of the Lawrence Dye Works Company at Lawrence, Mass.

1889.

WALTER H. KILHAM, *Sec.*

3 Hamilton Place, Boston.

Frank L. Pierce, late special inspector for the Factory Mutual Insurance Company of Boston, is now general manager of the Chelsea Jute Mills of Brooklyn, with offices at 346 Broadway, New York City. Owing to the removal of Frank L. Pierce, our former secretary, to New York, our president, F. W. Hobbs, has requested W. H. Kilham to act as secretary until the next meeting of the class.— George C. Harding, who is established as an architect at Pittsfield, Mass., has designed a large number of country residences in the Berkshires.— C. B. Moore is prominent in yachting circles at Annisquam, Mass., and in his spare time has designed a number of half-raters which have proved among the fastest in their class.— Hollis French, with his partner, Allen Hubbard (Yale, '83), is designing the heating, ventilating, and electrical plant for the new Yale Memorial buildings at New Haven. The auditorium is to seat three thousand people, and the dining hall about twelve hundred. The building is to contain elaborate kitchens, laundry, and refrigerating plants, all of which are being designed by French & Hubbard. They also have on the boards plans for the construction of a plant to transmit 5,000 H. P. fifteen miles by electricity.— Charles B. Dodge is in the real estate business at

257 Washington Street, Boston. — E. V. Shepard is chief clerk of the U.S. Patent Office at Washington, D.C., with authority over nearly seven hundred employees.— Walter H. Kilham has recently rearranged his offices at 3 Hamilton Place, Boston. He has on his boards plans for a large school building and several residences in the vicinity of Boston.- W. G. Bixby, treasurer, S. M. Bixby & Co., manufacturers of shoe blackings at 194 Hester Street, New York, has been, with Mrs. Bixby, spending his vacation with his parents at Salem.- J. Lawrence Mauran has dissolved his partnership with Shepley, Rutan & Coolidge, with whom he has been connected since leaving the Institute, and has formed a new copartnership under the name of Mauran, Russell & Gardner, with offices in the Chemical Building, St. Louis. He has taken over the entire St. Louis practice of Messrs. Shepley, Rutan & Coolidge. Among other large buildings, he is designing the Carnegie Library for Sedalia, Mo. — '80's contribution to the Gymnasium Fund is now $1,070. The amount is creditable, but it represents only a few subscribers; and many members of the class have not answered. It is hoped that each member of the class will feel it his duty to respond in some way, and maintain the record of the class.— F. W. Hobbs has been appointed by Governor Crane State trustee of the Lowell Textile School. The school — of which W. W. Crosby, '93, is principal — is finely equipped with machinery specially built for studying the manufacture of cottons, woollens, and silks, as well as dyeing and printing apparatus. There are five general courses, of three years each; namely, cotton manufacturing, wool manufacturing, designing (general course), chemistry and dyeing, and weaving. At the graduating exercises of the first class to leave the school, Mr. Hobbs delivered an address on "The Present Tendency toward Specialization in Textile Work in America, and Consequent Necessity for Textile Schools." — Arthur L. Davis is with the structural contracting department, American Bridge Company, 100 Broadway, New York, N.Y.— William S. Davenport is studying at Clausthal, Germany.— Alfred W. French is president of the French Oil

Mill Machinery Company, Piqua, Ohio.— Benjamin W. Guppy is bridge engineer, Maine Central Railroad, at 238 St. John Street, Portland, Me.— Jasper Whiting is travelling around the world for pleasure.— Harry H. Hunt is manager of the Tampa Electric Company, Tampa, Fla.— F. W. Ranno is engineer of maintenance of way, Southern Indiana Railway, Bedford, Ind.

1890.

GEORGE L. GILMORE, *Sec.*
Lexington, Mass.

Mr. Francis W. Dunbar and Miss Edith Vaughan Flanders were married Aug. 8, 1900, at Dover, N.H.— Knight C. Richmond is with Mr. T. P. Shelden, the architect, at Providence, R.I.— H. B. Burley has just recovered from a severe attack of typhoid fever. During his illness he was at the home of his brother-in-law, Dr. W. G. Curtis, also of the class of '90. — C. B. Beasom is at present inspecting the mills and factories around Boston.— We are pained to announce the death of our classmate, George D. Chapman, who died May 31 at Woodbridge, N.J. Mr. Chapman had been in poor health for the past year, but his illness had not been regarded as serious until within a few hours of his death. For five years he had been with the Fitchburg Machine Works; but about a year ago he left to accept a position with the New York Ship Building Company of Camden, N.J., where he had a bright prospect before him. Mr. Chapman will be very much missed at our future reunions, as he was one of the few who could always be depended upon to be present at all class gatherings and was always ready to do his full share financially.— Joseph B. Baker is with the Consulting Machine Specialty Company, 150 Purchase Street, Boston.— Elwood A. Emery is a vocal teacher at 51 St. Stephen Street, Boston.— John R. Hall is at Clear Lake, Minn.— Philip M. Hammett has become assistant superintendent of motive power, Boston & Maine Railroad.— Schuyler Hazard has become division engineer, New York Central & Hudson River Railroad, at Jersey Shore, Pa.— Clarence G. Norris is superintendent of streets at Hyde Park,

Mass.— E. S. Walker has been appointed assistant professor of civil engineering at the Pennsylvania State College, State College, Pa.

1891.

CHARLES GARRISON, *Sec.*
Lexington, Mass.

J. G. Barri is at Westfield, N.J.— L. A. Dunham is consulting engineer of the Meyer, Clarke, Rowe Mines Company, Kansas City, Mo.— Henry A. Fiske is superintendent of surveys, Underwriters' Bureau of New England, 93 Water Street, Boston.— Morris Knowles is assistant engineer in charge of Testing Station, Improvement and Filtration of the Water Supply, Philadelphia, Pa.— Alexander W. Moseley is assistant professor of applied mechanics at the Lewis Institute, Chicago, Ill.— Charles P. Wetherbee is assistant superintendent of the Bath Iron Works, Bath, Me.— The death of Arthur B. Stoddard, August 31, is reported.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*
Purdue University, Lafayette, Ind.

Mr. Walter M. Newkirk, of the Buhl Malleable Company of Detroit, passed through Boston on his vacation, September 13, for the first time since 1893. He had made a trip across the Great Lakes, Lakes Champlain and George, to New York City and Phillipsdale, R.I. He reports seeing Mr. Packard at the latter place, where he is doing some dredging on the Seekonk River, as previously reported. Mr. Ober is government engineer and inspector on this work. Mr. Newkirk reports meeting Charles C. Milburn on the Hudson River boat bound for New York, and says that Mr. Milburn, who "had not changed a particle," was just returning from some mining work in the State of Washington. He also reports Mr. Kales as doing a rushing business in Detroit.— B. P. Du Bois is paymaster in the United States navy at the New York Navy Yard.— William R. Kales is of the Whitehead & Kales Structural Contracting and Engineering Company, Detroit, Mich. — George H. May is chief chemist and works manager of the New York Leather and Paint Company.— George A. Merrill is with the New England Structural Company, East Everett,

Mass.— A. G. Pierce is technical engineer, direct currents, Edison Electrical Illuminating Company of Boston.— Frank C. Shepherd is assistant engineer, Street Department, city of Boston.— William C. Thalheimer is engineer for Harrington & Robinson & Co., 272 Franklin Street, Boston.—Francis Walker has been appointed professor of political and social science at Adelbert College, Cleveland, Ohio.— Murray Warner is in China, representing the American Trading Company of New York.

1893.

FREDERIC H. FAY, *Sec.*

60 City Hall, Boston.

Percy Holbrook Thomas and Miss Isabella Mary Patten, of Newton Centre, Mass., were married at the First Baptist Church of Newton, September 6, 1900. Mr. and Mrs. Thomas will reside in Pittsburg, Pa., where he is connected with the Westinghouse Electric and Manufacturing Company. Thomas will be remembered as the man whose scholarship record was the highest ever made at the Institute up to 1893; and the knowledge that this record would probably never be surpassed may have caused the Faculty shortly after to abolish "Honors" entirely. At any rate, the brilliant student of to-day can aspire to nothing higher than a "Credit." It could not be said of Thomas that he was a "grind" in the narrow sense, however. In the fall of 1892 he surprised us all by his good work on the 'varsity football team, where he played end in all but one of the games. His brother, J. W. Thomas, '95, was captain; and '93 was represented on that team by Abbott, Andrews, Dearborn, Taintor, P. H. Thomas, Simonds, and Wardner. We recall with pride the fact that the team won eight of the eleven games played, being defeated only by Harvard 'varsity, Amherst (one game), and Cornell. Thomas filled very creditably the part of statistician in '93's Class Day exercises. He is a member of the Delta Upsilon fraternity. The class will wish for him a future as bright as his past record has been brilliant.— Orton W. Albee is one of the patentees of the Baldt anchor, a new stockless anchor made of cast steel, which

is superior to the common type of anchor in that both flukes, instead of one, grip the bottom, thus giving much greater holding power for the same weight of metal. In construction the anchor is exceedingly simple, consisting of but two principal castings, the stem and the flukes, which fit together in a ball and socket joint that, in spite of wear, cannot get out of order. These anchors have been made in a number of sizes, ranging from 100 pounds to 14,000 pounds' weight, and are in use on ships of almost all maritime nations. The United States government has placed them on twenty-two torpedo boats, two light-house tenders, two revenue cutters, and the large army transports "Crook" and "Thomas." Baldt anchors are to be found on most of the steam merchant vessels built during the past three years on the Atlantic and Pacific coasts and the Great Lakes. They are made by the Baldt Anchor Company of Chester, Pa., of which company Albee is consulting engineer. A testing machine of 400,000 pounds' capacity has recently been built by this company to pull anchors according to Lloyd's Agency tests. The company has agencies in Canada, England, Holland, Russia, and Japan.— W. H. Graves, treasurer of the Grueby Faience Company, has just returned from Paris, where his company's exhibit of Grueby pottery won a gold medal. This high recognition of a Boston product is all the more gratifying as the pottery is a new departure in ceramic art, and has been entirely developed within the last three years.— S. P. Waldron, for some years assistant engineer at the Keystone Bridge Works of the Carnegie Company at Pittsburg, Pa., is now connected with the Eastern Bridge and Structural Company of Worcester, Mass.— Walter I. Swanton, formerly bridge inspector on the Boston & Albany Railroad, has been appointed naval inspector and stationed at the Norfolk Navy Yard, Portsmouth, Va.— Wallace C. Lambert has resigned his position of principal assistant to J. R. Worcester, structural engineer, 53 State Street, Boston, and is now with the New England Structural Company as assistant engineer at their Boston office.— Early in July, F. F. Skinner and

H. R. Kimball, both of them '93 men living in Boston, sailed from New York on the "Potsdam" of the Holland-America Line for a three months' European trip. They landed in Rotterdam, and were to visit Holland, Germany, Switzerland, and France, returning by way of England, Scotland, and Ireland. — F. W. Fabyan is a member of the Manchester Yacht Club and owner of the twenty-five-foot yacht "Flirt," which won considerable distinction the past summer by her remarkably fast sailing. Fabyan is a member of the firm of Bliss, Fabyan & Co., Boston, and has a summer residence at West Manchester, Mass.— At the Walker Building last September, Charles L. Norton gave exhibitions of the lighting effects of various types of ribbed and prismatic glass, describing the results of the experiments in this field made by him during the past four years. He demonstrated that by the intelligent use of such glass the gain in intensity of the light in the farther half of a room from forty to sixty feet deep is from ten to twenty fold, while the well-lighted area throughout such a room may easily be trebled or quadrupled. The glare of light near a window may be avoided without darkening the room by shades. Norton's demonstrations showed that this glass is particularly suited to use in school-rooms and factories, in which latter especially the absence of shades and lamps will greatly lessen fire risks.— Frederic W. Baker is with the New York Ship-building Company, Camden, N.J.— Charles N. Cook is president of the Silver Spring Bleaching and Dyeing Company, Providence, R.I.— Carleton E. Davis is resident engineer of Cedar Grove Reservoir, Department of Water, Newark, N.J.— Frederick W. Hadley is superintendent of Power Plant, Boston Terminal Company.— Edward M. Hagar succeeds Jasper Whiting, '89, as manager cement department, Illinois Steel Company.— Harry M. Latham is with the American Steel and Wire Company, Worcester, Mass.— J. Ramsey Speer, formerly general superintendent of the Shoenberger Works (Pittsburg) of the American Steel and Wire Company, has resigned from that company to become a member of J. R. & J. McK.

Speer Company, contractors for iron and steel products, coal, and coke. Speer is now located in the Empire Building, Pittsburg, Pa.— Winthrop L. Tidd is with Lockwood, Green Company, 93 Federal Street, Boston, Mass.— George L. Walker is of the firm of Walker, Stidham & Co., Civil Engineers, New York, N.Y.— Frederic A. Wallace is master mechanic, Pacific Mills, Lawrence, Mass.— S. Edgar Whitaker is general manager of Portland & Yarmouth Electric Railway Company, Portland, Me.

1894.

S. C. PRESCOTT, *Sec.*

Mass. Inst. Technology, Boston.

George E. Barstow is designer for the Thompson Electric Consulting Company, Lynn, Mass.— Lewis S. Greenleaf is with the American Bell Telephone Company, Boston.— Frank W. Lovejoy is manager of the Kodak Park Works, Eastman Kodak Company, Rochester, N.Y.— V. A. Mayer is in telephone installation work, Pike Building, Cincinnati, Ohio. — Clarence D. Pollock and George A. Taber are assistant engineers with the New York Rapid Transit Company, 13 Astor Place, New York, N.Y. — Walter O. Scott is inspector of milk, Providence, R.I.— Albert B. Tenney is secretary and manager of the Suburban Gas and Electric Company, Revere, Mass.

1895.

E. H. HUXLEY, *Sec.*

29 Hampshire Street, Camb'port, Mass.

Azel Ames, Jr., is supervisor of tracks, New York City.— Ernest F. Badger is chemist of the Rhode Island State Board of Health, 48 Weybosset Street, Providence, R.I.— Walter N. Crafts is superintendent of the Pittsburg Steel Foundry, Glassport, Pa.— Francis C. Green is general superintendent, Consolidated Car Heating Company, 413 N. Pearl Street, Albany, N.Y.— John H. Gregory is assistant engineer, Improvement, Extension, and Filtration of Water Supply, Philadelphia, Pa. — E. Lawrence Hurd is with the United Shoe Machinery Company, 205 Lincoln Street, Boston, Mass.— John D. J. Moore is general manager, Clayton Fire Extinguishing and Disinfecting Company, 11

Broadway, New York, N.Y.— Arthur F. Nesbit is associate professor of physics and electric engineering at New Hampshire College.— Walter F. Stevens is with the General Electric Company, Schenectady, N.Y.—William E. Swift is assistant engineer, New York Rapid Transit Railroad Commission.

1896.

F. E. GUPTILL, *Sec.*
71 Newbury Street, Boston.

Louis Shepard Morse was married to Blanche Lucille Gipe on Thursday, June 7, at York, Penn. At home after August 1, West King Street.— Mr. and Mrs. Edward F. Litchfield, of Lynn, Mass., announce the marriage of their daughter, Martha Towas, to Mr. John Gurney Callan on Wednesday, July 25. At home, Wednesday evening, September 19, at 23 Perkins Street, Lynn.— Henry Gardner is assistant to chief draughtsman, motive power department, Boston & Maine Railroad.— Edward B. Gardner, Jr., is with the National Steam Economizer Company, Springfield, Mass.—Joseph Harrington is agent for the Nicaragua Company, Dayton, Ohio.— Joseph M. Howe is assistant engineer, maintenance of way, Houston & Texas Central Railway.— Paul W. Litchfield is superintendent Goodyear Rubber and Tire Company at Akron, Ohio.— John E. Lonngren is general superintendent's private engineer, American Steel and Wire Company, Pittsburg, Pa.— George E. Merryweather has been in charge of the Brown & Sharpe exhibit at the Paris Exposition.— Charles K. B. Nevin is with Allen & Vance, architects.— Charles S. Newhall is mining engineer at the Brice Mines, Ontario.— Samuel T. Smetters is civil engineer with Scherzer Rolling Lift Company, Chicago, Ill.— Albert E. Smyser is assistant superintendent of the open hearth department, Duquesne Works of the Carnegie Company, Duquesne, Pa.— Charles H. Stone has been appointed second assistant State gas inspector of Massachusetts. — Bradley Stoughton is superintendent of the steel foundry at Derby, Conn.— William H. Thomas is with the Colonial Bleaching and Printing Company, Montreal.— Albert W. Thompson is superintendent of

machine shop, Amoskeag Manufacturing Company, Manchester, N.H.— Henry H. Tozier is chemist with the Nepera Chemical Company, New York, N.Y. — Charles E. Trout is with the Department of Docks and Ferries, New York, N.Y.— Hermann V. von Holst is head draughtsman with Shepley, Rutan & Coolidge, Chicago, Ill.

1897.

JOHN A. COLLINS, *Sec.*

55 Jackson Street, Lawrence, Mass.

Percy M. Smith was married on Wednesday, August 1, to Miss Ethel Burgess Torrey, of Rockland, Mass. Mr. Smith is with the Tremont and Suffolk Mills, Lowell.— Robert G. Hall was married on Tuesday, June 19, to Miss Josephine June Thompson, of Pueblo, Col.— Frederick L. Edmands is now in the Patent Office at Washington. There are not a few '97 men in Washington; and it would be well if informal meetings, such as monthly dinners at some hotel, could be held regularly. The secretary feels that he cannot emphasize too strongly the desirability of the men keeping track of one another, keeping the class organization intact, benefiting thereby not only themselves, but also Technology. It is through its alumni that a college becomes famous; and, if each alumnus severs all connection with his Alma Mater, of what use is he to her?— R. A. Bowen is at present on the road for the Buffalo Aniline Works, which company is making a strong bid for the dyestuff trade of this country, in competition with the large foreign corporations.— Argyle E. Robinson desires to announce to his friends that he has opened an office for the practice of architecture in Suite 622, 623 Oxford Building, 84 La Salle Street, Chicago.— The annual reunion and dinner of the class will be held some time in December, probably at Young's Hotel. Let us make this dinner a rousing one, abounding in plenty of the old-time under-graduate spirit. In case there be an intercollegiate torchlight parade this fall, in connection with the Presidential campaign, it is hoped that there will be an alumni division. If so, let every man in the vicinity of Boston appear. We all remember the good time in '96, and none of us is averse to another such evening.— Charles T.

Bramhall is chief draughtsman with the C. W. Hunt Company, West Brighton, N.Y.— Howard H. Burdick is chief inspector, Travellers' Insurance Company, Hartford, Conn.— Henry A. Clark is of the H. C. Clark & Son Machine Company, Lee, Mass.— Charles H. Eames is with Stone & Webster, 4 Post-office Square, Boston.— Mortimer Frank, M.D., is a physician at 233 Hampden Court, Chicago, Ill.— Walter A. Gleason is draughtsman with the Eastern Bridge & Structural Company, Worcester, Mass.— Owen H. Gray is superintendent of the Mutual Telephone Company, Des Moines, Ia.— Charles L. Hammond is with the Civil Engineer Department of Yards and Docks, at the Portsmouth Navy Yard.— Edmund B. McCormick is assistant professor of mechanical engineering at the Montana Agricultural College.— John S. Pechin is with the construction department, Illinois Steel Company, So. Chicago, Ill.— William S. Rhodes is assistant engineer, Street Department, Sewer Division, city of Boston.— John Taylor is with the General Electric Company, 200 Summer Street, Boston, Mass.— Lucius S. Tyler is with the electrical department, Boston & Albany Railroad, South Terminal, Boston, Mass.

1898.

C.-E. A. WINSLOW, *Sec.*

Hotel Oxford, Boston.

W. A. Marshall was married on the 14th of June, at Duluth, to Miss Nettie Howe, of that city. Marshall is now superintendent of the Woburn factory of Baeder, Adamson & Co., with which firm E. F. Russ is still connected as a general salesman.— H. T. Smith's address is now 33 North Third Street, Reading, Pa.— A. S. Keene is the second of the '98 architects in Boston to open an independent office.— C. F. Drake was married during the summer, but neglected to inform the secretary of the fact.— J. H. Larrabee is in the office of the U.S. engineer, Winthrop Building, Boston, engaged as draughtsman.— L. J. Seidensticker returned during the summer from a successful trip to Cuba, made for the purpose of studying some chemical features of the cane-sugar industry.— C. H. Pease has left Leavitt's draughting-room, Cambridge, and is with

the Edison Electrical Illuminating Company on Atlantic Avenue.— H. L. Coburn has been with Lockwood, Green & Co., 93 Federal Street, Boston, since July. He is designing steam-power plants for cotton-mills. H. H. Sullivan is in the employ of the same firm.— C. H. Smith is with one of the large insurance companies, at 31 Milk Street, Boston.— F. H. Twombly is with the United Mills Export Company, 68 Broad Street, New York, N.Y. — I. H. Kaufman and M. E. Taylor are with the G. F. Blake Manufacturing Company, Third Street, East Cambridge, Mass.— C. A. Torrey has left Johns Hopkins, and opened an office in Philadelphia. His specialty, as a consulting chemist, is the analysis of waste products.— F. H. Jones is in business with his father, Frank H. Jones, in Rochester, N.Y.—E. R. Springer is with the Boston Elevated Railroad Company in their Atlantic Avenue office. Springer was married soon after he left the army.— H. Snelling is an organizer, and a member of the Executive Committee, of the Middlesex Hunt Club, which is introducing 'cross-country riding in that county of Massachusetts. — R. W. Babson is actively interested in the projected electric railroad between Waverley and Concord, Mass., and has been working for its success in the various towns on its route during the autumn.— S. A. Hooker has left the locomotive works in Baltimore, and has gone into business with his father.— R. W. Pratt, Jr., who has been for more than a year in the engineer's office of the Massachusetts State Board of Health, made an elaborate study of the flow in various sections of the Metropolitan Sewerage System during the summer.— LeRoy H. Byam is an assistant engineer, Pennsylvania Division, New York Central & Hudson River Railroad, Jersey Shore, Pa.— Ira M. Chace, Jr., is a draughtsman, Wisconsin Division, Chicago & North-western Railway, Chicago. — Alvan L. Davis is an assistant superintendent, Ludlow Steel & Spring Company, Pompton, N.J. — Daniel W. Edgerly is a superintendent, Chilton Manufacturing Company, College Point, Long Island, N.Y.— Carl S. High is engaged in stock-raising at Arlington, Kan.— Charles S. Hürter is superintendent's assist-

ant, cyanide department, Cochiti Gold Mining Company, Bland, New Mexico. — Franklin M. Kellogg is with the Munson Steamship Company, 27 Williams Street, New York, N.Y.— Robert Lacy is an assistant engineer, Southern Railway, Washington, D.C.— Edmund C. Little is a draughtsman with Handy & Cady, Chicago, Ill.— Joseph J. Moebs is assistant engineer, Paving Division, State House, Boston, Mass.— George K. Newbury is with the American Shipbuilding Company, Cleveland, Ohio.— Edward W. Ritchie is a U.S. assistant engineer, Havana, Cuba.— William R. Strickland is chief engineer, Case Manufacturing Company, Columbus, Ohio.— Roscoe B. Whitten is an architect at Sydney, Cape Breton, N.S.— Atherton H. Tucker is with Stickney & Austin, architects, 50 Bromfield Street, Boston, Mass. — G. A. Hutchinson was in Boston for a few days in July *en route* from Milwaukee to Butte, Mont. A dozen of his classmates, mainly of the old Course II. gang, enjoyed an evening with him at the Technology Club; and the secretary exacted from the traveller a pledge, of which the following letter is the fulfilment: —

ANACONDA, MONT., August 5, 1900.

"In view of your dire threat to write yourself a letter and sign my name to it, in case I failed to send you my impressions of Butte, I am forced, however unwillingly, to speak for myself. If I made you my spokesman, the matter, it is true, would be far more entertaining, but I should be sailing under false colors; and my old friends, cognizant of my native prosiness, could not be imposed upon. When I awoke the morning before I reached Butte, I was on a Great Northern sleeper in North-western Montana; and a more desolate, barren, and absolutely uninteresting prospect I never saw. The country is rather rough and broken, but practically destitute of vegetation of any sort, save here and there a little sage. The surface is gullied by the rain, and the hillsides so steep as to resemble the slopes of a gravel bank more than anything else. As the train enters the valley of the Missouri, down which the Montana Central Railway winds its way from Great Falls to Helena and Butte, the scene changes.

Some vegetation appears, and the town of Great Falls makes a respectable showing of trees and grass. After leaving Great Falls, we approached the Rocky Mountains closer and closer, and finally wound in and out at the foot of rocky masses looming up into the air hundreds of feet high, and without a bit of soil or of verdure to conceal or soften the rough outlines. Now and then the train shot through a tunnel, and finally entered the valley where nestles Helena, guarded on all sides by high mountains. Seventy-five miles more through similar scenes brings the traveller to Butte, now the principal city of the State, thanks to its rich copper mines, but twenty-five years ago not even on the map. I don't dare tell how many inhabitants there are. I think the number depends on who is telling the story. But it is safe to say that there are more than twenty-five thousand people and less than seventy-five. In the business centre the city looks quite metropolitan, with many pretentious brick blocks, though not a few ramshackle wooden buildings are interspersed. The outskirts contain many of the old log cabins of the first settlers. There are plenty of pretty homes indicative of wealth and taste, but the curious feature is the lack of grass or even of weeds. In one or two yards good bits of lawn are to be seen, where evidently loam has been brought in and the seed carefully watered. But, generally speaking, the soil is too poor to grow anything, and nobody tries. A fine brick mansion, the most pretentious in town, has the small space between it and the sidewalk paved with cobblestones. Here and there, to shade a piazza, one sees an evergreen tree brought down from the mountain and stuck into the ground in front of the house. Cats there are and dogs galore, in spite of many statements to the contrary which I heard in the East. The city is built on a hill, and there are hills on all sides. The mines underlie the town, and one sees prospect holes and signs of mining operations everywhere. A family that I know of heard an unaccountable noise one night in their cellar, and upon investigation found that a portion of it had caved in as a result of mining operations below. The altitude is something over a mile

above sea level, and living expenses are higher yet. To put it moderately, seventy cents expended in the average town of the same size in the Eastern or Central State will buy as much as $1 in Butte, perhaps more. Street-car men receive thirty cents per hour, and are now demanding thirty-five, with not less than ten hours' work. Miners earn $3 or $3.50 per day; and unskilled labor, in general, secures similar remuneration, while skilled mechanics can earn much more. In view of the high expense for living, and general unattractiveness of the place, which has practically nothing to offer in the way of amusement, good pay is necessary in order to make it an object for any one to stay. There seems to be in general an air of uncertainty, of indifference to the surroundings, as though people are here merely for what they can make, and hope to get away as soon as they can. These are first impressions, of course, and must be taken as such. As for me, I am located in Anaconda for the present, at the smelter of the Anaconda Copper Company. This town is twenty-six miles from Butte, is located in the middle of a long, narrow valley, flanked with mountains on both sides, some of them so high that patches of snow are visible even now, the fifth day of August. It is pleasanter than Butte, since the soil is more fertile, and there are some green trees and green lawns; but for the most part it is untidy and unkempt. The sole industry is the copper smelting, and every business enterprise in town depends directly or indirectly on it for its very existence. An exceedingly short stay in this region suffices to impress me as never before with the quiet, serene beauty of the old New England towns with which I am familiar, and to which I hope some time to return if Dame Fortune smiles upon me."

1899.

WALTER O. ADAMS, *Sec.*
1776 Mass. Ave., North Cambridge, Mass.

The marriage of Lawrence Addicks to Miss Mary M. O'Brien at Philadelphia, in June, 1899, is hereby very tardily announced to the class officially. Lawrence still keeps at the head of the class. He is in charge

of the testing laboratory, Raritan Copper Works, Perth Amboy, N.J.— The monthly class dinners will be held again this fall, the first one coming in October. Ample notice will be given as to time and place.— The subscriptions to the Walker Memorial Fund continue to come in. There are many men, formerly prominent in class and Institute affairs, that have not been heard from as yet. The committee looks to them for their usual aid. — The departure of Miles Sherrill for Leipzig, and his consequent resignation of the vice-secretaryship, deprives the class of an efficient officer. An election for his successor will be held at the annual class dinner. — Patch left for Beirut, Syria, in August. He is instructor in sciences at the Syrian Protestant College at that city.— John H. Adams is draughtsman with Peters & Rice, architects, Tremont Building, Boston.— Walter R. Bean is with the New York Ship-building Company, Woodbury, N.J.— Raymond F. Bennett is with the bridge department, New York, New Haven & Hartford Railroad, New Haven, Conn.— Harry A. B. Campbell is with the Baldwin Locomotive Works, Philadelphia, Pa.— James K. Clark is draughtsman with the Keystone Electric Company, Erie, Pa.— Harvey M. Cushing is in the testing department, General Electric Company, Schenectady, N.Y.— Miss Henrietta C. Dozier is in the office of W. T. Downing, architect, Atlanta, Ga.— John A. Fleming is with the New York & New Jersey Telephone Company, Brooklyn, N.Y.— Arthur L. Hamilton is secretary and treasurer, Marinette Iron Works Manufacturing Company, Marinette, Wis.— Edward Herbert is with the Western Electric Company, Chicago, Ill.— Bernard Herman is with the engineer of bridges and building, Baltimore & Ohio Railroad, Baltimore, Md.— H. Philip James is assistant electrical inspector with the Factory Mutual Fire Insurance Companies, 31 Milk Street, Boston.— Almeron W. McCrea is with Warren & Wetmore, architects, New York, N.Y.— Harry S. Mork is chemist with the Cellulose Products Company, 28 Binford Street, Boston.— Worthington Palmer is in the office of George Cary, architect, Buffalo, N.Y.— William E. Parker is

with the Newport News Shipbuilding & Dry Dock Company, Newport News, Va.— George H. Perkins is instructor in mechanical drawing at the Lowell Textile School, Lowell, Mass.— William C. Phalen is professor of chemistry in the New Mexico School of Mines, Socorro, N.M.— Ernest A. Regestein is in the testing department, General Electric Company, Schenectady, N.Y.— Samuel B. Robertson is with the engineer of maintenance of way, Pittsburg Division, Pittsburg, Cincinnati, Chicago & St. Louis Railway.— William O. Sawtelle is instructor in science at the high school, Bangor, Me. — Edward W. Sibley is with the Sales Bleachery, Salesville, R.I.— Philip Stockton is treasurer of the Lowell Bleachery.— Jacob Stone, Jr., is with the Pittsburg Plate Glass Company, Ford City, Pa.— John L. Tufts is with the Laurel Hill Chemical Works, Laurel Hill, Long Island, N.Y.— Frederick A. Watkins is with the Western Electric Company, Chicago, Ill.

1900.

George O. Adams is chemist at the Experiment Station, Lawrence, Mass.— Elbert G. Allen is a graduate student at the Massachusetts Institute of Technology.— Harrison E. Ashley, 947 Acushnet Avenue, New Bedford, Mass.— Charles Edw. Baldwin is chemist with Cellulose Products Company, Binford Street, Boston.— Morgan Barney is draughtsman in the office of H. C. Wintringham, naval architect and engineer, 32 Broadway, New York City.— Charles A. Barton, Jr., is in the engineering department of the New York Western Electric Company, 8 125th Street, New York, N.Y.— Robert S. Blair, Waterbury, Conn.— Ingersoll Bowditch is rodman for the Ludlow Manufacturing Company, Ludlow, Mass.— P. R. Brooks is with the Chicago, Burlington & Quincy Railroad, Beardstown, Ill.— Clarence C. Brown is with the American Bell Telephone Company, 15 Oliver Street, Boston. — Charles H. Brown is in the laboratory of the United States Leather Company, 30 Ferry Street, New York City.— Stephen P. Brown, Dover, Me. — F. D. Buffam is personal assistant to the head mechanical engineer of the Pennsylvania

Steel Works Company, 132 Locust Street, Harrisburg, Pa. — Edw. E. Bugbee is assistant in mining engineering at the Massachusetts Institute of Technology.— R. G. Burnham, "learner" in the power department of the Pennsylvania Steel Company, Steelton, Pa.— Marion L. Cade is private assistant to Mrs. Richards at the Massachusetts Institute of Technology.— Walter C. Chaffee is with J. D. Mason, architect, 85 Edmund Place, Detroit, Mich.— Aurin M. Chase is mechanical engineer of the Syracuse Chilled Plow Company, Syracuse, N.Y. — Percival C. Clow, draughtsman with the Eastern Bridge and Structural Company, Worcester, Mass.— William R. Collier is with M. W. McRae, consulting engineer, at 233 Equitable Building, Atlanta, Ga.— Franklin N. Conant is electrical engineer with the Bell Telephone Company, Antwerp, Belgium.— Harold S. Conant is at the Dow Academy, Franconia, N.H., as science and higher mathematics teacher.— Frederick H. Cooke is draughtsman for the Brown Hoisting and Conveying Machine Company of Cleveland, Ohio.— Francis B. Dutton is with the Great Northern Paper Company of Millinocket, Me. — W. A. Edson is assistant superintendent in a piano factory at Cambridgeport, Mass. — Lewis Emery has been in Europe ever since he graduated. — Stanley G. H. Fitch is with the Elberton Oil Mills, Elberton, Ga., as refiner.— George B. Ford is a fifth year student at the Institute.— Charles M. Fosdick is assistant in civil engineering at the Massachusetts Institute of Technology. — Stephen F. Franklin is a graduate student, Massachusetts Institute of Technology.— George C. Gibbs is draughtsman for the Brown Hoisting and Conveying Machine Company, Cleveland, Ohio.— Milton W. Hall is a student in the medical department of the University of Illinois, Evanston, Ill. — Dean Hinman is assistant to the city engineer of Taunton, Mass.— Robert M. Hopkins is assistant engineer of the Bay Counties Power Company of San Francisco, Cal.— Frank N. Horton is draughtsman with the Lockwood, Green & Co. mill engineers, 93 Federal Street, Boston.— Charles C. Johnson

is with the Boston Transit Commission, 20 Beacon Street, Boston.— Henry D. Jouett is inspector of bridge erection for the New York Central & Hudson River Railroad, Utica, N.Y. — Leigh S. Keith is with the engineering department of the New York Telephone Company, 18 Cortlandt Street, New York, N.Y.— Arthur I. Kendall is a chemist at Ciriclare, La.— Herbert O. Keay is with the Nicholson File Company, Providence, R.I.— Grace Langford is at Wellesley College as instructor in physics.—Lewis M. Lawrence is teacher of drawing at the Mechanic Arts High School, Belvidere Street, Boston, Mass.— Robert H. Leach is a mining engineer at South Mountain, Idaho.—Edith Lilienerantz, 359 Telegraph Avenue, Oakland, Cal.— Robert R. Lingley, with the Whitlock Coil Pipe Company, Elmwood, Conn.— Francis X. McGowan, with the Western Electric Company of New York City.— S. M. Manley is with the Silver Spring Bleaching and Dyeing Company, Providence, R.I.— D. E. Maxfield is assistant in the testing department at Watertown Arsenal.— Arthur C. Melcher is private assistant to Dr. Whitney at the Massachusetts Institute of Technology.— Charles Van Merrick is draughtsman with the New York State Canal Survey, Syracuse, N.Y.— George B. Moody is draughtsman for the Newport News Company, Newport News, Va. — H. L. Morgan is consulting engineer in the New York Telephone Company, New York City.— Walter A. Moulton is with the Illinois Steel Company of Joliet, Ill.— Newitt J. Neall is with the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa.— H. E. Osgood is assistant to master mechanic and chief engineer at the Upper Pacific Mills, Lawrence, Mass.—L. D. Peavey is with the New England Structural Company, Everett, Mass. — Thomas D. Perry, A.B., is assistant in the mechanical department of the Library Bureau, Boston, Mass.— Paul L. Price, graduate student, Massachusetts Institute of Technology.— John L. Porter, draughtsman, Wall Street, New York City. — Walter L. Rapp is with George W. Rapp, architect, Johnston Building, Cincinnati, Ohio.— Arville C. Redman is

in the engineering department of the Sewer Division, Washington, D.C.— Chester A. Richardson, Pelham, N.H.— E. H. Ritcher is assistant engineer at the Lower Pacific Mills, Lawrence, Mass.— George E. Russell is an assistant instructor at the Massachusetts Institute of Technology.— W. W. Sanders is superintendent of the Victoria Chemical Works, Chicago Heights, Ill.— Lewen F. Searle is in maintenance of way department of the New York Central & Hudson River Railroad, New York City.—Kenneth Seaver is in the office of the chief engineer of the Pennsylvania Company, Pittsburg, Pa. — Frederick W. Snow is a mining engineer at Rishenbar, Ariz. — Frederic W. Southworth is draughtsman with H. A. Phillips, architect, 120 Tremont Street, Boston.— W. Leonard Stevens is assistant in mining engineering at the Massachusetts Institute of Technology.— Lewis Stewart is with Charles A. Platt, architect, 107 E. 27th Street, New York City.— Henry H. Sullivan, draughtsman in machinery department of Lockwood, Green & Co., mill engineers, 93 Federal Street, Boston.— Russell Suter is in the office of the city engineer of Cambridgeport, Mass.— Harry M. Thayer is with the Inter-State Cotton Oil Company, Augusta, Ga., as refiner and chemist.— Clinton D. Thurber is draughtsman with the bridge and construction department of the Pennsylvania Steel Company, Harrisburg, Pa.— Percival E. True is chemist with the Bowker Fertilizer Company, Elizabethport, N.J.— Warren C. Tudbury, in maintenance of way department, New York Central & Hudson River Railroad, New York, N.Y.— Emil F. Vogel is in the crane department at the Case Manufacturing Company, Columbus, Ohio.— Arthur C. Walworth, Jr., steam engineering, 100 Pearl Street, Boston.— Frank D. Warren is with Dean & Main, mechanical and mill engineers, 53 State Street, Boston, Mass.— William H. Wedlock is with the Sewer Division of the Boston Street Department, 30 Tremont Street, Boston.— Percy R. Ziegler is with the Western Electric Company, 57 Bethune Street, New York City.

REVIEWS

RAILROAD CURVES AND EARTHWORK

By C. Frank Allen, S.B., M. Am. Soc. C.E., Professor of Railroad Engineering in the Massachusetts Institute of Technology. New York: Spon & Chamberlain.

For logical arrangement, clearness of statement, and conciseness of demonstration, this little book is a model of its kind. The nomenclature is simple and convenient, the figures clear, and the typography excellent. While the book was prepared and primarily intended for the use of engineering students, it contains much of interest and value to engineers generally, not only in the method of treatment, but also in new material.

The subject opens with a discussion of the reconnoissance and the preliminary and location survey. Then follow chapters on simple, compound, and reverse curves, the treatment of compound curves being novel and much simpler than that adopted by previous writers. The chapter on parabolic curves, both horizontal and vertical, will be found of service to the landscape engineer in staking out roads, paths, etc., where instrumental precision, except as to grade, is not required. The chapters on turnouts, Y tracks, and crossings, contain many new demonstrations.

The "cubic parabola" is suggested as a convenient spiral easement curve, which approximates the desired "curve of constantly and uniformly changing radius," and its functions are developed. Its use is recommended, however, only when the more convenient ables for spiral curves, such as those contained in Searles's "Railroad Spiral," are not at hand.

The latter half of the book is devoted to "Earthwork," which is admirably treated. It contains chapters on staking out, method of computing, special problems, tables, and diagrams of quantities, haul, and mass diagram. Of these chapters, those on staking out and method of computing earthwork, and on the mass diagram,

are worthy of special notice. The discussion of the six general methods of computing earthwork — particularly the development of the prismoidal formula and prismoidal correction — is excellent, bringing together, as it does in a concise manner, the several methods in common use and commenting upon their application. The mass diagram for determining haul, in its relation to cost, to the spoil bank and the borrow pit, is somewhat novel, and worthy of wider use.

While this book cannot, strictly speaking, be considered a field book, as it lacks the necessary tables of curves and logarithmic functions, it is a notable addition to the literature of railroad curves and earthwork, and a valuable supplement to other field books upon the subject. As compactness is essential, however, to the convenient use of any field book, it is to be hoped that the requisite tables may be added to the next edition of this admirable little book, and thus avoid the present necessity of carrying with it for use in the field a separate book of tables and constants. L. M.

THE COST OF LIVING AS MODIFIED BY SANITARY SCIENCE

By Ellen H. Richards, A.M., S.B. (M. I. T. 1873), Instructor in Sanitary Chemistry, Massachusetts Institute of Technology. pp. 121. New York, John Wiley & Sons, 1899.

"The Cost of Living" is an intelligent analysis of the expenses of a household. It is not based upon the absurd sums of three and four hundred dollars per year for a family near our American cities. It is an investigation of the cost of existence of those who earn, as do the majority of the most intelligent American families,— students, professors, business men, and professional men,— from two thousand to five thousand dollars a year, as it is from this class that we may most confidently expect a great advance in the next generation in the knowledge of how to make the best use of life and how to get the greatest pleasure from the money expended. Chapters are devoted to Standards of Living; the Service of Sanitary Science in increasing Productive Life; Household Expendi-

ture and the Division between Departments according to Ideals; the House and the Rent, or Value and Furnishing; the Operating Expenses; Fuel, Light, Wages; Food; Clothing in Relation to Health; the Emotional and Intellectual Life; and the Organization of the Household. Two tables of budgets are given, one made up of typical ones, another made up of ideal ones. In these tables are given the per cent. of the total income which has been spent, on the one hand, for Food, Rent, Operating Expenses, Fuel, Wages, etc., Clothes, and Higher Life, Savings, Charity, etc., while, on the other hand, what should be spent for these items.

HYDRAULIC DIAGRAMS FOR THE DISCHARGE OF CONDUITS AND CANALS

By Charles H. Swan, Member, and Theodore Horton (M. I. T. '94), Junior Member, of the American Society of Civil Engineers. pp. 43; 16 diagrams. New York, Engineering News Publishing Company, 1899.

The long and responsible service of the late Charles H. Swan in connection with sewerage and other hydraulic works for the city of Providence, and later for the Metropolitan Sewerage Commission of Massachusetts; and the valuable, if less extended, experience of Mr. Horton,— have enabled these authors to prepare a book of great practical worth to hydraulic and sanitary engineers. It is intended to aid in the study of such sections of closed conduits and open canals as are commonly employed in sewerage, water supply, water power, and land drainage.

Of closed conduits, eight different types of cross-section are included; and open canals embrace both rectangular and trapezoidal forms, the rectangular being made, in fact, the basis of computation for the trapezoidal. The diagrams are framed upon the widely used formula of Ganguillet and Kutter, which Mr. Swan was the first engineer to put into graphic form for use in sewerage work. They are computed for a single coefficient of roughness ($n = .015$) for closed conduits and a single coefficient ($n = .025$) for open

canals; but, by the aid of a very convenient diagram of relative values, the discharge corresponding to any other probable coefficient can be obtained.

Diagrams Nos. 5 to 12 show the relative proportions of a variety of standard sections in use for large water-supply conduits and sewers, including those adopted for the Wachusett and new Croton aqueducts, several typical forms used in the Metropolitan sewers, such as the "Catenary," "Basket-handle," and "Gothic" sections, and the egg-shaped form, so frequently introduced in the combined system. They at the same time present curves showing the relative changes in water section, mean velocity and discharge, for all depths of flow. By referring appropriately to these diagrams, in combination with Nos. 1 to 4, the velocity and discharge for any one of the given forms, for any depth of flow, and for any probable size, grade, or character of surface, may be quickly ascertained with sufficient precision for practical purposes. The remaining diagrams deal with open rectangular and trapezoidal sections, and permit the easy determination for such forms of the same general results already mentioned for closed conduits.

Clear directions are given for dealing with any problem that may arise, as well as typical solutions. The diagrams have been ingeniously devised, are clearly printed, and should be of much service to engineers, both in designing new conduits and in determining hydraulic values for existing ones.

DWIGHT PORTER.

REPORT UPON NEW YORK'S WATER SUPPLY, WITH PARTICULAR REFERENCES TO THE NEED OF PROCURING ADDITIONAL SOURCES AND THEIR PROBABLE COST, WITH WORKS CONSTRUCTED UNDER MUNICIPAL OWNERSHIP

By JOHN R. FREEMAN (M. I. T. '76). 587 pp. New York, Martin B. Brown Company, 1900.

This report ranks among the most valuable of recent contributions to the subject of water-supply engineering. It is in the form of a bound volume of nearly six hundred pages, which is not prepared for publication and sale, but is simply a special report to the

Comptroller of New York, Bird S. Coler, whose emphatic protest against the Ramapo Water Scheme is a matter of general knowledge. The spirit in which the investigation was undertaken is set forth in the first page of the report: "It is but just to yourself, in view of recent events, for me to record your earnest expression to me that you were not asking for evidence to be collected with a view to sustaining your personal views, but that what you wanted was a fair-minded determination of the truth by an engineer familiar with water supply and removed from local prejudices,— to get together as much reliable information on New York's need for more water as is possible in the time available, and present it without reserve."

A proper appreciation of the report can be realized only by keeping in mind the fact that the "oral request of Aug. 24, 1899," was followed by this very complete report by Mr. Freeman on March 23, 1900. The report takes up, first, the capacity and adequacy of the existing supply with reference to the present and immediate future; second, the question of waste prevention; third, the sufficiency of present supply for fire protection; fourth, available sources for additional supply; fifth, a discussion of the proposed Ramapo supply.

The report states in relation to certain of the investigations: "A careful recomputation has been made of the actual run-off of the Croton River day by day for the past thirty-two years, applying more accurate data to computing the flow from the old records of depth; whereby it plainly appears that the computations heretofore relied upon gave too large a flow by about 10 per cent."

"An investigation by experiments on full-size models of the Croton dam crests proves that the formula used heretofore for computing the water wasted exaggerated this flow about 9 per cent."

"A gauging of the flow of the new aqueduct made (at my request) by the same assistant engineer, with the same current meter by which the new aqueduct was originally gauged, proves that this has suffered an impairment of about forty million gallons per day in carrying capacity, due probably to its not being kept clean."

"The corrected results of the Croton River gaugings, covering this period of thirty-two years, and of the Croton Watershed rainfall records, have been condensed into tables and diagrams of great value for estimating the safe yield of such other watersheds as may be selected for new sources of supply."

"The present rate of consumption of Croton water, in gallons per day, has been accurately measured, with the result of showing that the estimates of consumption and of growth in consumption of water made by the Department of Water Supply at the time the Ramapo contract was urged were about forty million gallons per day too large."

"A very full geological study of the deep subterranean strata of Long Island and of Staten Island has been made with a view to learning of the possibility of a supply from deep wells, and of the best means of obtaining water from the saturated gravel. This, as already stated, shows that a deep artesian well supply, adequate for any general public supply, is practically hopeless."

The recomputation of the quantity wasted over the dam involved the abandonment of the formula previously used, but which was not adapted to the existing form of dam. Further than this, it was found that the length of dam was more than ten feet less than that formerly used for all depths above eight inches; that the depth previously used was incorrect, both because the dam crest is no longer level and in view of the further fact that the actual readings were all in error by .30 feet, and, in addition to this, only half of the readings taken were previously used. The result showed a total error of 9 per cent. in the flow. Freeman did not depend on old formulas, however; for he was not content until his results were corroborated by careful laboratory experiments on full-sized models duplicating the form of the dam. The determination of the flow of the old Croton aqueduct involved the critical examination of various records of old gaugings, dating back more than thirty years, the making of a series of new gaugings, an examination as to the difference in coefficients for clean and for foul walls of conduit, a comparison of coefficients found correct in the new Croton aqueduct and in the Sudbury conduit, the Wachusett aqueduct and the

Dorchester Bay Tunnel. It was also found that there had been loose methods of gauging in use; and Mr. Freeman's estimate of an error of fourteen million gallons in twenty-four hours, or 15 per cent., he considers conservative.

With the recomputations made of the records from 1868 to 1899, Freeman believes that the error in the estimate of the "mean flow for a month or a year is less than the ordinary error of measurements of a water supply by plunger displacement." With reference to its bearing upon the yield of the Croton and other drainage areas, the rain gaugings were overhauled, and the comparative weight determined of those taken at four different parts of the area, this being necessary, since some of the gauges were set in unsuitable proximity to trees, and at some of the earlier dates the readings were not entitled to full credit. These recomputations also were from 1868.

The study of the question of waste prevention involved measurements of the consumption of water at various hours of the day and night, showing for a minimum at 2 to 4 A.M. a rate of as much as ninety-six gallons per day, while the maximum reached only forty-three gallons more than this. In addition to this, experiments were made in Fall River and Woonsocket for comparison, these cities being very fully furnished with meters. The sources of leakage are investigated in detail and very thoroughly, as also the effect of the use of meters and of special systems of waste detection, for the purpose of doing away with undue waste. The results enable him to estimate the probable demand per head of population for a series of years, both under existing and improved conditions; while a further study of the probable increase in population became necessary, to reach the total supply needed for the future.

The problem of storage was studied by the modern method of "Mass Curve," which is readily made to show the depletion of the reservoir at any time and under any assumption as to draft. While this involved much labor in preparation, the curves, when drawn, allow very simple means of studying problems of storage and depletion. Mr. Freeman finds that with the completion, in 1902, of the new Croton dam (now under construction, with C. S. Gowan,

'71, in charge), the economical storage limit of the Croton basin will then have been reached; while as early a date as 1905 will mark the ultimate safe limit of the present supply.

The general question of water pressure and fire protection is thoroughly within the limits of Freeman's special experience, so that it required little effort for him to comply with the requirements in this direction. Under the heading of "Basis of Estimating Costs" were investigated the determination of section of aqueduct, the costs for "cut and cover" construction, for tunnels lined wholly or in part only, and also for large steel conduit construction, requiring a consideration of carrying capacity as well as type of construction as to rivets and the like. Interest, depreciation, taxes, and sinking fund formed items for study, as also cost of maintenance of conduits.

Then follows the consideration of the various possible sources of supply, twelve in number, for six of which estimates were made in considerable detail. For the supply favored by the report the investigation was fairly complete, and included the design of section of dam and its location, both with a reasonably close approximation, actual contour surveys being specially made at the proposed dam site. Among the items are a relocation of a railroad for twenty miles and the making good, in some way, about ninety miles of highways, the building of a distributing reservoir, and computing the damage in the case of various water powers. Of course, the storage reservoir and the conduit furnish occasion for detailed estimates. In this supply, the Ten Mile River and Upper Housatonic supplies (combined), the drainage area is in excess of one thousand square miles.

Considerable attention is also given to the project of taking a supply of filtered water from the Hudson above Poughkeepsie, with provision for augmenting the supply from the Adirondacks,—a scheme which has altogether met with considerable favor by other investigators, and whose merits are here recognized. The Ten Mile River and Upper Housatonic scheme he favors, subject to arrangements being made through the Connecticut legislature for granting rights or possibly setting off most of the territory necessary to be

acquired or controlled. For this scheme his estimate is that a supply of seven hundred and fifty to eight hundred million gallons per day will cost about $10 per million gallons.

Mr. Freeman takes up the Esopus Creek Supply (the Ramapo scheme), which provides for the inefficient amount of two hundred million gallons, and shows that it would cost, including sinking fund, less than $30 per million gallons, or less than half the amount provided for in the contract of the Ramapo Company, which, however, did not provide for the acquirement of the works. The actual cost without sinking-fund provisions would be about $20 against the proposed contract price of $70, this on even terms. The Hudson River supply from Poughkeepsie, including filter basins and storage basins in the Adirondacks, would yield eight hundred million at a cost of $50 per million, including sinking fund, or much less than the Ramapo contract.

Mr. Freeman was fortunate in having regularly as assistants Messrs. M. Knowles, '91, G. A. Taber, '94, E. D. Pingree, '96; and among those whom he thought it proper to mention, in view of valuable assistance rendered him, are found C. S. Gowan, '71, and J. Waldo Smith, '87, while Professor Crosby was responsible for the geological reports.

That Mr. Freeman should have been able to present so able and so comprehensive a report in the limited time at his disposal is doubly an occasion for surprise and commendation, in view of the fact that his position as president and treasurer of three insurance companies had apparently put him outside of direct engineering activity. His capacity for handling this work (in addition to his business duties with his companies), in considerable part through assistants, stamps him as possessing the ability to ably direct the work of others,— an ability of a higher order even, in the estimation of many, than that shown in the individual work which secured for him, on two separate occasions, the Norman Gold Medal of the American Society of Civil Engineers.

A CENTURY OF SCIENCE AND OTHER ESSAYS

By John Fiske. Boston, Houghton, Mifflin & Co., 1900.

In "A Century of Science and Other Essays" John Fiske has brought together fourteen magazine articles and public addresses, chiefly of the last ten years. They range in scope from the progress of pure science in one hundred and twenty-five years to a discussion of such "eccentric literature" as attempts to square the circle. The larger number deal with historical and literary subjects, and all are written in Mr. Fiske's usual lucid, instructive, and interesting manner. The biographical sketches of Edward L. Youmans, Francis Parkman, and Edward A. Freeman are worth specially noting.

A DIVIDEND TO LABOR: A STUDY OF EMPLOYERS' WELFARE INSTITUTIONS

By Nicholas Paine Gilman. Boston, Houghton, Mifflin & Co., 1899.

This volume is principally devoted to a consideration of employments in which the laborer gets the benefit of something more than mere wages, but not to the extent of direct profit-sharing. Germany, France, Holland, Belgium, England, and the United States are passed in review. As samples of some of the ways in which employers voluntarily seek to better the material and intellectual conditions of their workmen may be cited the practice of the Krupp Works in Germany of loaning money at low rates for building houses, setting up stores at which goods are sold at only a slight advance above cost, establishing hospitals and schools, aiding in life insurance and in other similar ways. In our own country we find employers assisting in savings and building undertakings, providing lodgings and board at cost or less, furnishing libraries, gymnasiums, and recreation grounds, and so on. The last one hundred pages of the book treat of profit-sharing itself, and this part is practically a supplement to the author's book on profit-sharing published some years ago.

POLYPHASE ELECTRIC CURRENTS AND ALTERNATE CURRENT MOTORS

By Silvanus P. Thompson. Spon & Chamberlain, New York.

The second edition of this work, with the addition of twenty-four colored diagrams and other improvements, is without any doubt the best general text-book in the English language to-day for the use either of the instructor or of the classes in electrical engineering in any institution in the country.

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The diagrams of polyphase armature windings, with the different phases indicated by the use of (for example) red, green, and black lines, render it very much easier to see clearly the proper relations between the poles and the coils at any one time.

Chapter XIV., devoted to the considerations of polyphase static and rotary transformers, contains a very great amount of information; yet it must be confessed that it is not satisfactory and not up to date in this important particular. There is no treatment of the so-called "pumping" of rotaries and the methods for preventing it, nothing of the over-compounding and parallel running in sub-stations, nothing of the use on a three-wire system with the neutral passing by, etc. W. L. P.

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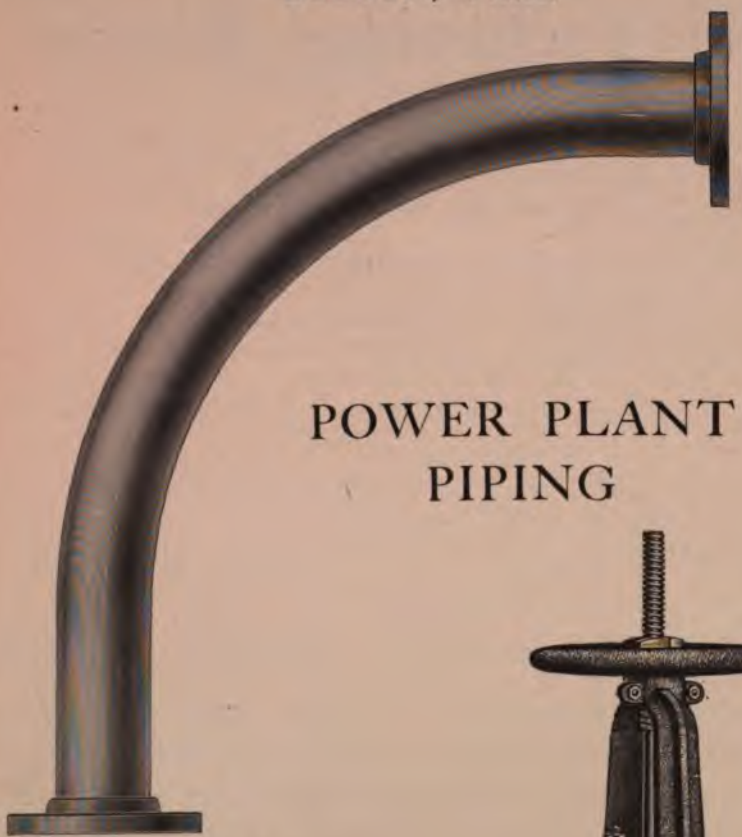

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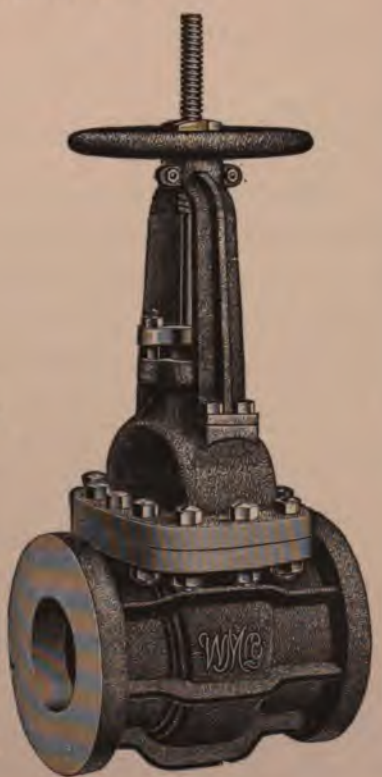

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